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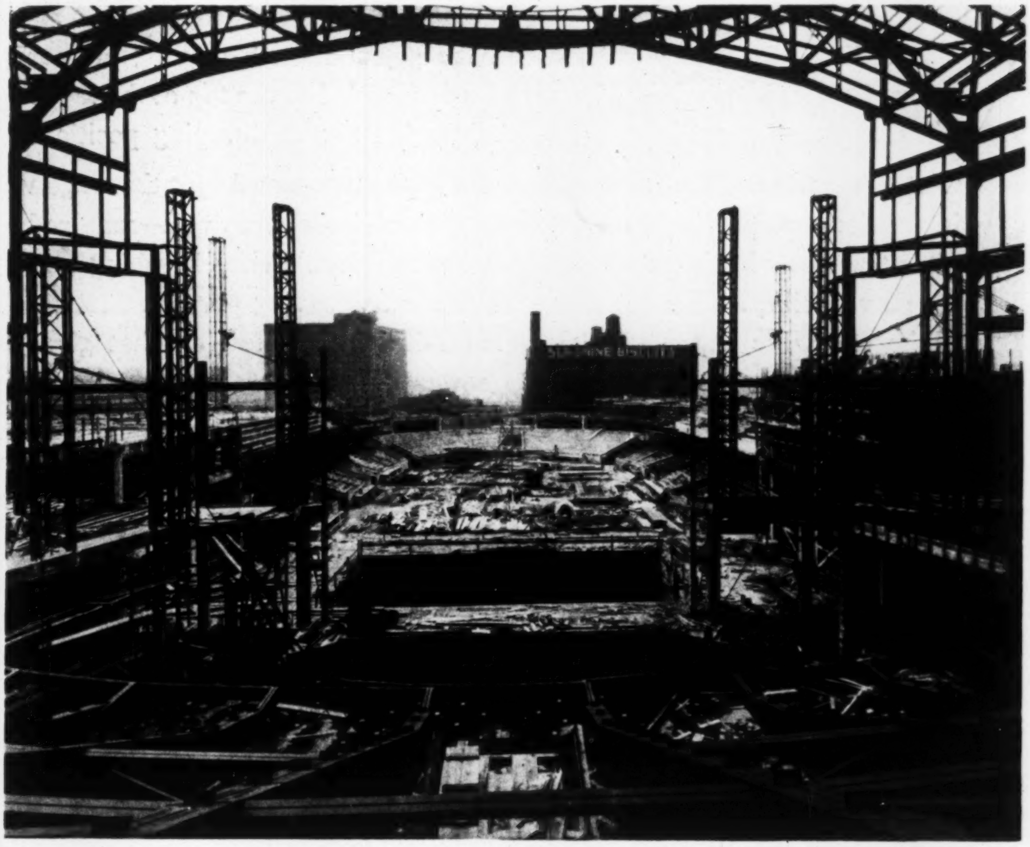

A construction view of the new municipal auditorium at St. Louis, looking from the balcony of the 3,500-seat theater through the stage opening into the 12,000-seat arena before the 266-ft.-span roof trusses were erected

Atchafalaya River Bridge Sets New Records

St. Louis Builds a Great Auditorium

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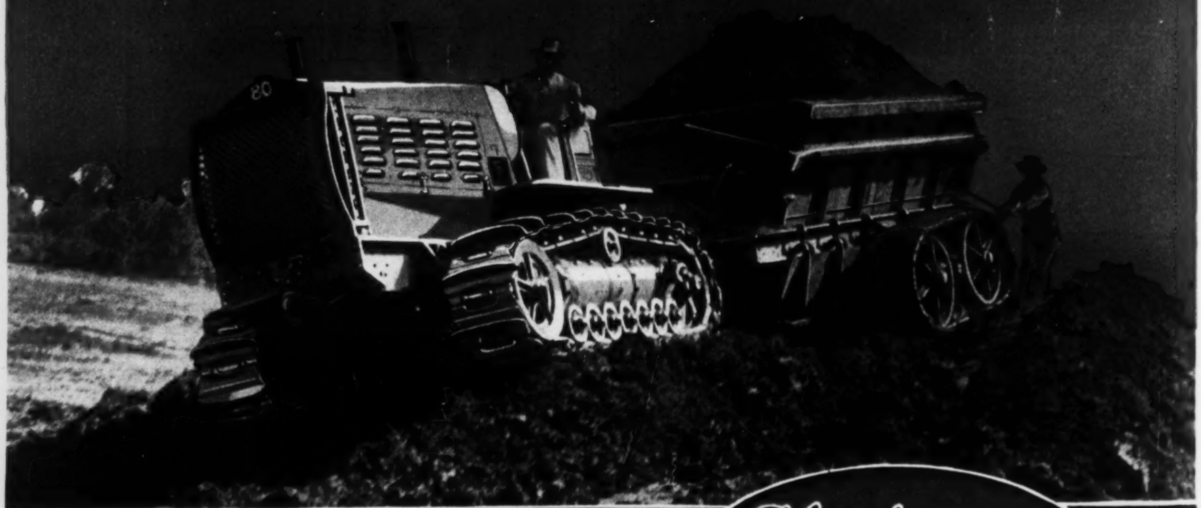

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St. Louis Builds a Great Auditorium

Municipal community center covering a 3½-acre site facing the Memorial Plaza is two buildings in one, a 3,500-seat theater and a 12,000-seat arena—Arena portion is in effect a concrete stadium roofed over with steel trusses

THE HUGE municipal auditorium and community center building which St. Louis has dreamed of for a decade and contracted to build in 1929 is rapidly nearing completion. Comprising an integral part of the extensive Memorial Plaza development for which $15,000,000 was voted in 1923, the new structure will give St. Louis facilities for conventions, exhibitions, concerts, athletic meets, opera and dramatic performances second to none in the country. The structure itself, covering over 3½ acres, is unique in that it is two buildings in one, separated by a stage common to both. On one side of the stage is a theater, opera house and concert hall seating 3,500 persons. On the opposite side is a great arena, in effect a 12,000-seat concrete stadium, roofed over with steel trusses of 266-ft. span. Beneath the entire building—that is, on the first-floor level—is a hall for equipment and machinery exhibits; the arena floor also is designed to supplement the exhibit space, having a live-load capacity great enough for the heaviest machinery.

The municipal auditorium occupies the entire block from 14th to 15th Sts. on Market St. and extends south almost two full city blocks toward Clark Ave. With its completion the entire south frontage on the proposed Memorial Plaza will be occupied by public buildings (*Fig. 2*). The east frontage on 12th St. is occupied by the new Civil Courts Building completed in 1929. The north frontage and the Plaza itself are cleared of old buildings, but otherwise they are undeveloped.

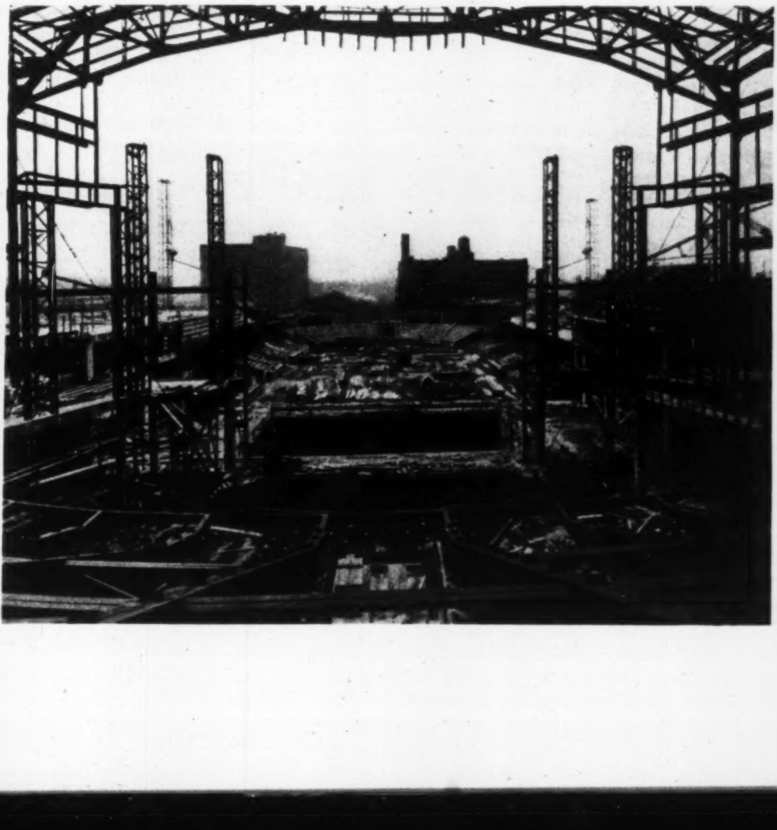


Fig. 1—Looking from the theater balcony through the stage opening into the 12,000-seat arena of the new St. Louis Municipal Auditorium. Concrete-pouring operations are in progress. Later this arena was roofed with 266-ft. span steel trusses.

After the bond issue was voted in 1923, the task of designing the Memorial Plaza and the buildings surrounding it was given over to a commission composed of eight firms of architects and two firms of structural engineers, including La Beaume & Klein; Mauran, Russell & Crowell; Geo. D. Barnett, Inc.; T. P. Barnett Co.; Preston J. Bradshaw; Helfensteller, Hirsch & Watson; William B. Ittner; Klipstein & Rathmann; Brussell & Viterbo; and Taxis & Becker. Two ex-officio members of the commission were also appointed, namely the president of the Board of Public Service and the engineer of the City Plan Commission.

The area to be utilized for plaza purposes includes nine city blocks exclusive of the two already occupied by the City Hall and and the old Municipal Courts Building. The plaza area will be developed with fountains and pools, extending from 12th to 15th Sts., between Market and Chestnut Sts. With the exception of clearing the entire site of old two- and three-story

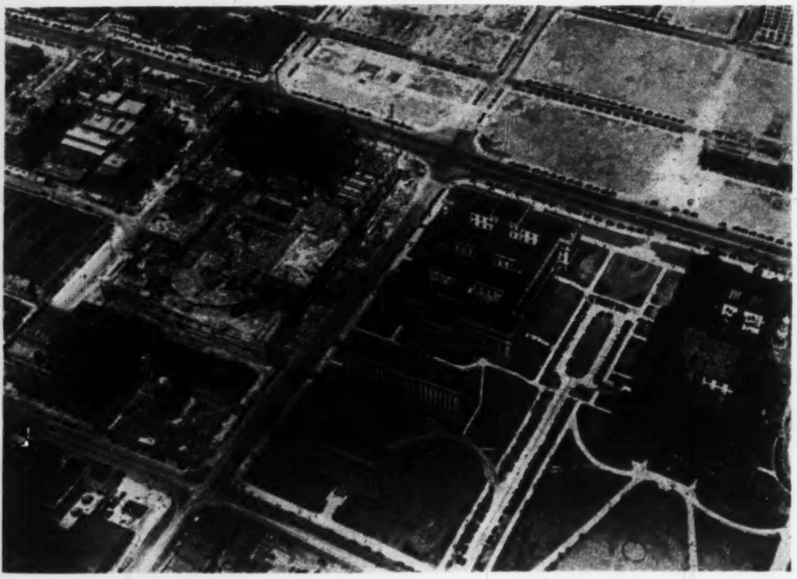


Fig. 2—Without its roof the arena of the St. Louis Municipal Auditorium appears as a typical concrete stadium. Theater steel is shown completed. View shows the six-block Plaza area from which all old buildings have been removed. In the foreground, forming the south frontage of the plaza (along Market St.), are, from right to left, the City Hall, the Municipal Courts Building and the auditorium.

brick buildings, the only structures so far undertaken are the completed Civil Courts Buildings and the new auditorium.

Auditorium layout and design

The over-all dimensions of the Municipal Auditorium are 322 ft. east and west and 493 ft. north and south. The height from the street to the ridge line of the main arena is 162 ft., while the interior height of the arena from floor to ceiling is 90 ft. The arena, with the exception of the roof trusses and the short columns supporting them, is of reinforced-concrete construction. The theater portion also is of reinforced-concrete construction up to the second-floor level, but balconies are supported by steel cantilevers and there is in general more steel framing than in the arena.

The theater or Music Hall is separated from the arena by a stage 142 ft. long and 48 ft. deep. The proscenium at the arena side and the proscenium on the Music Hall side will be equipped with soundproof curtains, permitting the stage to be used in connection with either unit. It is also possible to raise both of these curtains so that the entire seating capacity of both units can be made available for a single event.

On either side of the Music Hall smaller halls have been provided seating 750 persons each. These halls are provided with separate entrances, stairways, elevators, cloakrooms, etc. The Music Hall and arena are likewise served by individual facilities, so that all units may be used at the same time by separate organizations without interference.

Exhibit space available totals 94,000 sq. ft. on the first floor and about 25,000 sq. ft. on the arena floor.

The exterior walls of the building are faced with limestone in harmony with the monumental character of the design and in conformity with the present Municipal Courts Building and the new Civil Courts Building.

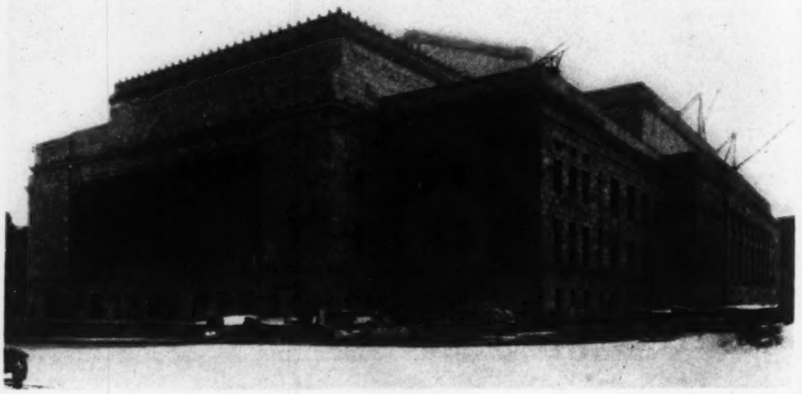
Structurally the building is notable principally for its large steel trusses and some of the details in connection with them. Design of the reinforced-concrete framing, which is used up to the second-floor level in the Music Hall and to the top of the seat tiers in the arena, was in general that encountered in any frame building, with the added complications of ramps and of the inclined girders that carry the seats. Except for the columns in the exhibit area, which are supported on spread footings, caissons carried to rock comprise the foundations. In the Music Hall, 6-in. concrete slab-and-girder-type floors are used. Flatslab floors designed for 300 lb. per sq. ft. are required in the arena and exhibition areas.

Long trusses are required over the Music Hall (142-ft. span), over the arena (266-ft. span) and over the stage proscenium openings (75-, 110- and 144-ft. spans). H-sections are used extensively for truss members. The stage truss arrangement is somewhat unusual because there are proscenium openings on both sides. On the arena side there is a layout involving inner and outer proscenium trusses (as shown in Fig. 4), an arrangement required by the architectural framing of the opening. The inner proscenium, 110 ft. wide, is spanned by two trusses, one above the other. The lower truss is between El. 71 and El. 100, and the upper truss is between El. 129 and El. 154. The 14-in. 228-lb. H-columns, with 1½ in. of coverplates on either flange, that carry these trusses, rest on a 4½-in. steel slab set on the concrete frame at the second-story level, El. 28.5. The outer proscenium truss is located 20 ft. in front of the inner trusses and between El. 100 and El. 129. This truss has a span of 144 ft. and rests on relatively short H-section columns seated on the concrete frame of the arena at El. 92.5. The maximum chord section in these proscenium trusses is a 12-in., 220-lb. H.

On the Music Hall side of the stage the proscenium truss is located between El. 129 and El. 154. It has a span of 75 ft. and is carried on 14-in. 300-lb. H-columns resting on the concrete frame at El. 28.5. The south half of the Music Hall roof is framed with four trusses of 142-ft. span running east and west. Framing into the north truss of this group are three trusses of about 70-ft. span running north and south and covering the north half of the hall.

The trusses that comprise the main roof framing of the arena are of exceptional span, 266 ft., and in addition are supported at one end by a rocker column. These trusses, of which there

Fig. 3—The St. Louis municipal auditorium is faced with limestone. View shows Market St. and 15th St., corner.



are nine, are 50 ft. deep at the center and spaced 24 ft. apart. The members are H-sections, of which the heaviest is a top chord panel, 14 in. and 228 lb. The rocker column was necessary to take care of expansion and contraction movements in the truss, which may be of considerable magnitude. Because this column may tilt outward at the top of the truss as much as 1½ to 2 in., special details are required to keep any of this movement from being transmitted to the outside walls, which are carried on separate columns. Thus, as shown in Fig. 4, the wall is framed outside the column, and the belt courses of stone (which must come in over the top of the column) rest on plates fastened to the column with bolts in slotted holes.

Concreting work

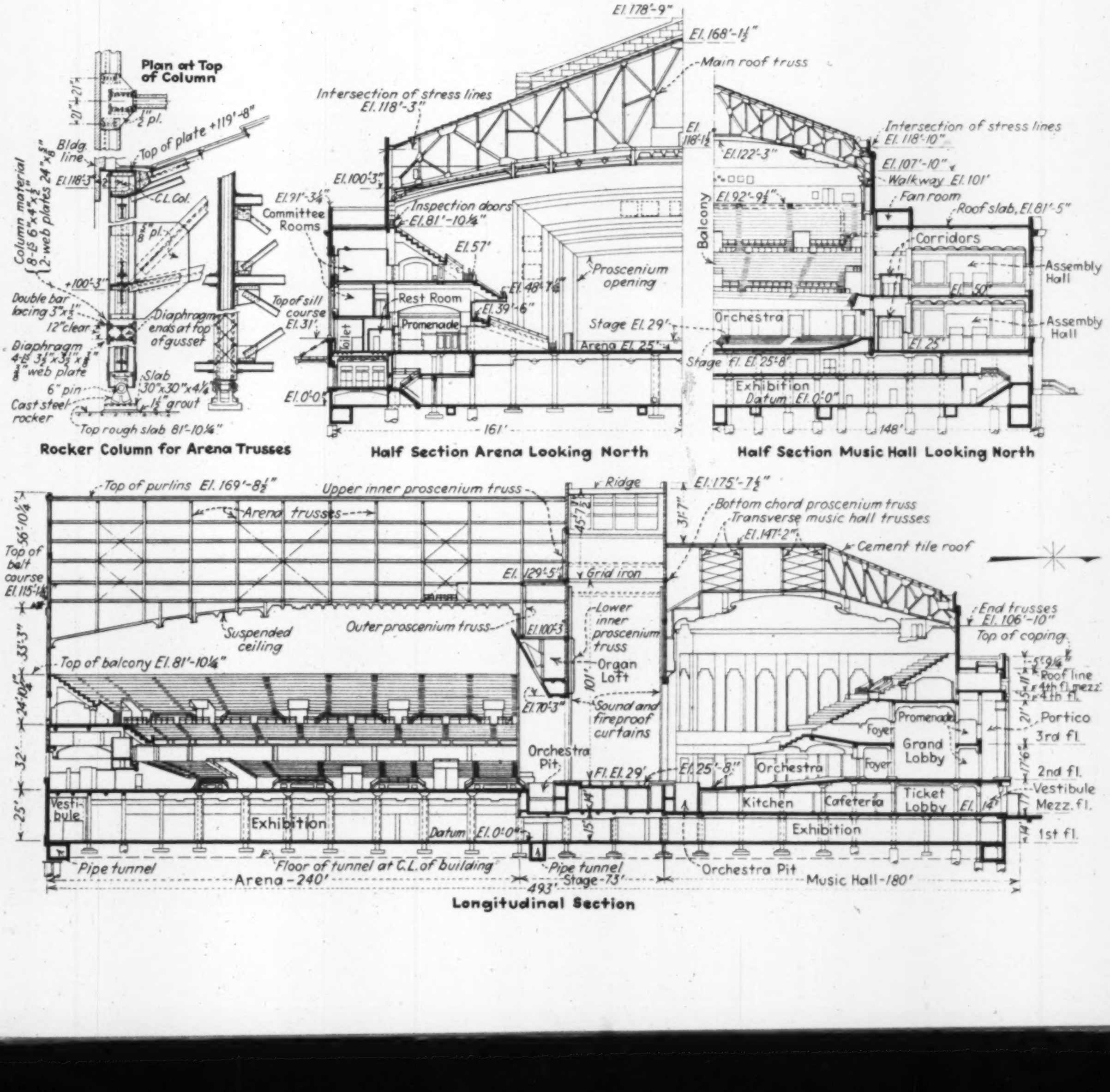
Construction procedure on the building was somewhat unusual because of the area covered. To begin with, two concrete hoist towers were placed on the sidewalk area along the east and west side of the arena portion, and two concrete masts were set up at the front corners of the building on Market St. These hoisting units, in combination with belt conveyors, placed all of the concrete below and including the arena floor and all of the concrete in the Music Hall area. Concrete for the tier seats and framing above the arena floor was distributed by chutes. All concrete was delivered from a central plant. Mixing time was 1 min. in the plant and 5 min. in the transporting trucks. Designed for 2,000 lb. per sq. in., the average strength secured was about 3,800 lb. per sq. in. A 1:2½:3½ mix was used, with 7½ gal. of water per sack.

Steel erection

Erection of the 4,000 tons of structural steel in the auditorium presented a number of interesting features. The work was divided into three units—the theater, the stage and the arena. In the theater, which contains 1,560 tons of steel in the balconies and roof, no unusual problems were encountered. The weight of the heaviest truss is 51 tons, and this was erected with two 20-ton, 100-ft., boom guy derricks, one on each side, and one 10-ton guy derrick set in the front center.

With the theater steel in place, the two 20-ton guy derricks were used to set two 15-ton steel stiff-legs on the concrete floor (El. 92.5) on each side of the stage. Erection of the stage steel was particularly difficult and hazardous because of the long-span proscenium trusses and their great height above the stage floor. For example, the bottom chord of the theater proscenium truss is 101 ft. above the stage. H-section hangers suspended from this chord support a member consisting of two 15-in. laced channels, forming the head of the proscenium. In erecting this steel, wood bents were used to support this head, the hangers were utilized as shores for the truss bottom chord, and the truss and penthouse framing (the latter 147 ft. above the stage) were erected on the hangers and tied into the theater steel.

The wood bents used for the theater proscenium were also suitable as falsework for the lower of the two inner



Rocker Column for Arena Trusses

Half Section Arena Looking North

Half Section Music Hall Looking North

Longitudinal Section

Plan at Top of Column
21"
21"
½" pl.
Top of plate +119'-8"
Bldg. line
El. 118'-3"
C.L. Col.
Column material 8-Ls 6"x4"x½" 2-web plates 24"x⅝"
⅝" pl.
+100'-3"
Double bar lacing 3"x½"
12" clear
Diaphragm ends at top of gusset
Diaphragm 4-Ls 3½"x3½"x⅜" ⅜" web plate
6" pin
Cast steel rocker
Slab 30"x30"x4¼
1½" grout
Top rough slab 81'-10¼"
Top of sill course El. 31'
El. 91'-3¼"
Committee Rooms
El. 100'-3"
Intersection of stress lines El. 118'-3"
El. 178'-9"
El. 168'-1½"
Main roof truss
Inspection doors
El. 81'-10¼"
El. 57'
Proscenium opening
El. 48'-7¼"
Rest Room
El. 39'-6"
Promenade
Toilet
Stage El. 29'
Arena El. 25'
El. 0'-0"
161'
El. 118'-1½"
El. 122'-3"
Balcony
El. 92'-9½"
Intersection of stress lines El. 118'-10"
El. 107'-10"
Walkway El. 101'
Fan room
Roof slab, El. 81'-5"
Corridors
Assembly Hall
El. 50'
Orchestra
Assembly Hall
El. 25'
Stage fl. El. 25'-8"
Exhibition
Datum El. 0'-0"
148'
Top of purlins El. 169'-8½"
Upper inner proscenium truss
Ridge
El. 175'-7½"
Arena trusses
56'-10¼"
Top of belt course El. 115'-1¼"
45'-7½"
31'-7"
Bottom chord proscenium truss
Transverse music hall trusses
El. 147'-2"
Cement tile roof
El. 129'-5"
Grid iron
Suspended ceiling
Outer proscenium truss
El. 100'-3"
Lower inner proscenium truss
End trusses El. 106'-10"
Top of coping
33'-3"
Top of balcony El. 81'-10¼"
Organ Loft
101'
5'-9¼"
Roof line
4th fl. mezz.
4th fl.
24'-10¼"
El. 70'-3"
Sound and fireproof curtains
Promenade
Portico
Foyer
Grand Lobby
3rd fl.
32'
Orchestra Pit
Fl. El. 29'
El. 25'-8"
Orchestra
Foyer
17'-6"
2nd fl.
Vestibule
Mezz. fl.
25'
Vestibule
Kitchen
Cafeteria
Ticket Lobby
El. 14'
14'
15'
Exhibition
Datum El. 0'-0"
Exhibition
1st fl.
Pipe tunnel
Floor of tunnel at C.L. of building
Pipe tunnel
Orchestra Pit
Arena - 240'
Stage - 73'
Music Hall - 180'
493'

Fig. 4—The St. Louis auditorium is two buildings in one—a 3,500-seat theater and a 12,000-seat arena divided by a huge stage. A 90,000-sq.ft. exhibition hall occupies the entire first floor. Long-span steel trusses are features of the roof and proscenium framing.

trusses of the arena proscenium. Since there are no ties between this truss and the theater proscenium truss, it was necessary to lash 12x12-in. wood timbers 60 ft. long between them to stiffen the top chord of the arena truss. These timbers were also used to support a working platform and safety deck. The upper, inner, arena truss was erected over the lower truss, again utilizing the hangers between the two as shores. The outer arena proscenium truss was erected with a stiff-leg derrick placed on top of a movable steel falsework tower set up on the arena floor and used later for erecting the arena roof trusses.

With all of the proscenium trusses in place, it became necessary to move the stiff-leg derricks at El. 92.5 down to El. 82, so as to erect the stage wings and to assist in erecting the main arena trusses whose supporting columns begin at this level. In order to avoid the hazard, delay and expense of dismantling, moving and re-erecting the derricks, it was decided to roll them on ramps to their new locations. The booms were removed to lessen the danger of overturning and to lighten the load, since the derricks, exclusive of electric hoists and swingers, weighed 45,000 lb. each. The operation was successfully carried out, with consequent speeding up of the work.

The third unit to be erected—the roof over the arena—involved 1,800 tons of steel, consisting principally of the nine 266-ft.-span trusses weighing 90 tons each and set on heavy columns 38 ft. long. The center sections of the bottom chords of these trusses are 93 ft. above the arena floor, and the trusses are 50 ft. deep at the center. The interference of the concrete balconies, the great height and length of these trusses and the necessity of taking all steel over the sides made it necessary to use the three stiff-leg derricks previously mentioned, i.e., one on the low roof on each side (El. 82) and one on the movable tower 70 ft. above the arena floor. This tower carried steel falsework for the support of the trusses at the center and a working deck at El. 100. The heavy weight of this piece of equipment and the heavy loads it handled, required that all columns and shores be aligned with columns supporting the arena floor. In addition to the steel falsework, three self-supporting timber towers and one A-frame bent were used in erecting the arena trusses. These towers permitted setting the bottom chord and suspended ceiling (which was extremely complicated) before filling in the truss, thus avoiding the increased hazard and delay of working over the tops of the trusses.

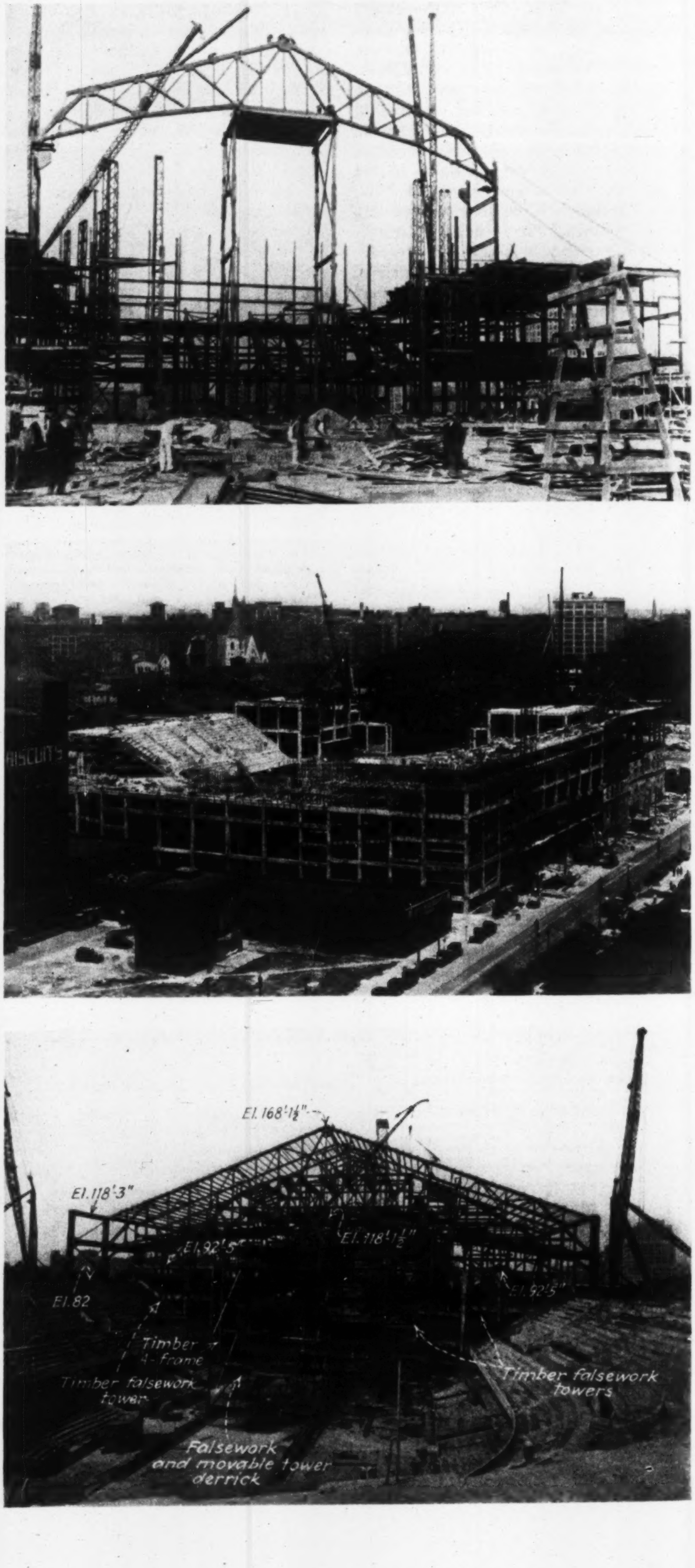


Fig. 5—Three stages of construction. At top: a theater roof truss. Center: stiff-leg derricks in place for stage steel erection and concreting towers and chutes in operation on the arena seats. Bottom: erecting the 266-ft.-span arena roof trusses.

The shores and towers were placed on the center lines of the trusses with a transit, and the bottom chord was set, by means of a level, slightly above the theoretical camber. The best record made on the job was in moving the side derricks, the tower derrick and the shores twice and filling in two complete panels, about 400 tons of steel, in one week.

The usual procedure after erection was to rivet the bottom chord complete and have the remainder of the truss well bolted and pinned before releasing the jacks and camber blocking. A careful check was made as the trusses were being swung, and in each case the center deflection was from ⅝ to ¾ in. For comparison, one truss was riveted complete before swinging, but this caused little difference in the deflection.

After completing the first four panels, with work proceeding from north to south, the curved end of the balcony interfered, and the rest of the steel had to be set from the opposite, or south end. It was therefore necessary to remove the steel falsework from the tower, revolve it 180 deg. and move it and the two stiff-legs south as far as possible. The south-wall framing was of column-and-beam construction and extended 87 ft. above the top of the balcony to a point about 175 ft. above street level. Since it was impractical to guy this wall steel, it was initially set only to the elevation of the bottom chord of the adjacent roof truss. When this chord was erected, it was tied to the wall steel by struts and by diagonal cables to assure rigidity and safety. The wall and the truss were then run up together, and the upper portion was braced with diagonal cables.

In erecting these latter trusses the curve of the balcony made it impractical to use the timber tower shoring used on the four north trusses. Bents therefore were designed to rest on the balcony and were guyed in place.

The architects for the St. Louis municipal auditorium are La Beaume & Klein. Structural engineers are Brussel & Viterbo, while the general contractor is the Boaz-Kiel Construction Co. The steel, fabricated by the Mississippi Valley Structural Steel Co., was erected by the Ben-Hur Erection Co., St. Louis.

Results of Tests on the Effect of Molasses on Concrete

By Miles N. Clair and M. A. Morrissey
Vice-President and Testing Engineers, Respectively, The Thompson-Lichtner Co., Boston, Mass.

ALTHOUGH concrete structures have been used to some extent for the storage of molasses and it is recognized (in the 1924 Joint Committee report) that molasses has some effect on concrete under certain conditions, engineering literature is practically devoid of any information on this special exposure condition. The information presented here was developed several years ago during the study of the condition of concrete tanks used for the storage of molasses at a plant producing breakfast food. In some cases satisfactory results had been obtained by using tanks constructed with unprotected concrete, but in other cases disintegration had been noted. It was believed that the age of the concrete at the time of exposure to the molasses, as well as the kind of molasses, had some bearing on the ability of the concrete to resist attack. To obtain information for guidance in future construction, some laboratory tests were made. For reasons of economy neat cement briquet specimens were used. The effect of exposure to two grades of molasses upon the briquets at various ages (unprotected and with three types of protective coatings) was investigated.

A standard portland cement was used, and the briquets were made in accordance with the standard procedure for cement testing, except that the water content corresponded more nearly to that used in concrete. One set of specimens was subjected to standard water-storage conditions. Two sets were taken from the molds after 24 hours' damp storage, and one was placed in light molasses and the other in dark molasses. One set was given standard storage for seven days and then placed in light molasses. Another set was given standard storage until 28 days old and then placed in light molasses. Three sets were given standard storage for seven days, then the surface was dried and a protective coating was applied to each. These coatings were magnesium fluorosilicate, sodium silicate (commercial waterglass), and a colorless waterproofing liquid with a paraffine base. When the coatings became dry, after several hours, the briquets were placed in light molasses. The briquets were completely immersed in the molasses in these tests.

The tests involving exposure to the action of the molasses at the age of one day were used to accentuate the effect. The exposures at ages of 7 and 28 days were included to check up on the cause of the condition of two tanks, one partly filled at 7 days with light molasses and badly disintegrated and the other filled at 30 days with dark molasses and in excellent condition. The tests were completed by examining the broken briquets to determine the penetration of the molasses and its effect.

The effect of the molasses upon the cement was most interesting, as the appearance at the surface of the break of the greatly affected specimens was similar to that of briquets that have been frozen—*i.e.*, as though the fracture took place along the planes of large crystals. The surface of the specimens was soft and easily scratched with the fingernail. The greatest disintegration occurred in the specimens exposed at an early age. Honeycombs approximately ⅜ in. in diameter, formed by cracks, covered the surface of the specimens. The cracks penetrated apparently as far as the molasses. The penetration of the molasses was readily apparent from the discoloration of the cross-section; in the worst cases it extended to the center of the briquets.

Although no chemical tests or research were undertaken, we believe that the action of the molasses on the cement results in the formation of calcium succinate, which disrupts the structure of the cement. The dark molasses contains more glucose and albuminoids than the light, also more highly refined molasses, and does not react as strongly with the lime of the cement.

Although it is recognized that these tests were very meager, it seems reasonable to conclude that:

1. The destructive effect is great on cement if subjected to the action of molasses at early ages of hydration, but slight after an age of 28 days. The effect consists of an appreciable softening of the cement and of disruptive cracking.
2. The light refined molasses has a greater effect on the cement than the dark partly refined molasses.
3. Protective treatments, such as magnesium fluorosilicate, sodium silicate and the colorless waterproofing are effective for several months when applied to concrete subjected to exposure to light molasses at an age of 7 days. After one year's exposure, however, these treatments cease to be properly effective. The sodium silicate treatment showed improvement at one year over the untreated specimens of the same age exposure, which seemed to indicate that if the concrete must be exposed to molasses at an early age, a heavy coating of sodium silicate would be the most effective of the treatments investigated.

In conclusion, the authors recommend (recognizing that these tests were made on neat cement and not concrete) that concrete which is to be exposed to the action of molasses be treated at an age of 3 to 5 days with three coats of sodium silicate, the first two coats using the commercial waterglass diluted to half its concentration, and the last coat using the material full strength, after which it is allowed to harden for at least 28 days before exposure to the molasses.

Atchafalaya River Bridge Sets New Records

One pier of structure at Morgan City, La., is deepest yet sunk, extending 176.5 ft. below water level—Three 600-ft. truss spans, 100 ft. deep at the center, erected on falsework near shore and floated into place on piers 50 ft. above water level

By D. T. Jerman
District Engineer,
The Foundation Co., Pittsburgh, Pa.

A NOTABLE highway bridge has recently been completed over the Atchafalaya River between Morgan City and Berwick, La. In addition to furnishing a free bridge instead of a toll ferry on the much-traveled Old Spanish Trail (US Route 90), the structure involved construction methods on both foundation sinking and steel-truss erection that were quite out of the ordinary. One of the river piers extends farther below water level (176.5 ft.) than any other bridge foundation yet completed. Caisson sinking was difficult and hazardous because of deep water and about 40 ft. of soft mud. These same conditions precluded the use of falsework in the stream for superstructure erection and led to a scheme of floating the three main spans into place. Inasmuch as these spans were more than 600 ft. long and more than 50 ft. above the water, the operation was a spectacular and exacting one.

The Morgan City bridge consists of two 126-ft. deck-truss spans, three 608-ft. through-truss spans and long approaches. Of the four main piers, two are located near the shore and two in the river. The through trusses are of the K type, 100 ft. deep at the center and spaced 28 ft. apart. A 24-ft. concrete roadway and one 3-ft. sidewalk are provided. The two end spans have a grade of 10 ft. in their length, while the middle span is level.

The Atchafalaya River is a tidal stream at Morgan City. Consequently, closed cofferdams were used to create still water in which to land the two river caissons. The cofferdams were five-sided inclosures of steel piles supported by a timber fender structure on each side parallel to current flow and a braced timber-pile cluster in the nose, which was pointed upstream. Timber piles were 110 to 120 ft. long, made by splicing two shorter lengths, and steel sheetpiles were 80 ft. long; short pieces of wood piles were bolted to the bottom of the steel sheeting in order to keep it from settling too deep in the soft muck of the river bed. The downstream end of the cofferdam was left open until the caisson was floated in.

At the location of the two river piers the water was about 53 ft. deep and the river bottom consisted of a 30- to 40-ft. depth of semi-fluid silt, which offered practically no resistance to sinking. On account of this unstable bottom, steel floating caissons 44 ft. in diameter, with a 20-ft.-diameter open dredging well, were used. The cutting-edge section was built as a unit 30 ft. high. Additional build-up sections, 8 ft. in height, were added to the outside and inside shell as necessary to bring the top of the concrete pier, built inside the caisson shell, above water. On the deep pier this height from cutting edge to top of steel shell was 110 ft. A system of jet piping through both the inner and outer shells was built into the caisson, as shown in Fig. 4.

The cutting-edge sections were fabricated complete on barges at Midland, Pa., on the upper Ohio River, and towed to the bridge site. Each unit of the shipment, on two 26x100-ft. barges lashed together, consisted of two caissons, each weighing 108 tons.

Due to the possibility of encountering sunken debris, the specifications required that compressed air be used after the caissons had been landed on the riverbed. They were then to be excavated under air until all obstructions were removed, or the limits of air work reached, and then to be dredged in the open until satisfactory material was encountered. This procedure necessitated designing a steel deck that could be placed and removed under water. A structural-steel seat riveted to the inner shell 38 ft. above the cutting edge furnished the support for this deck, which was bolted in place by divers and then removed when air work was completed.

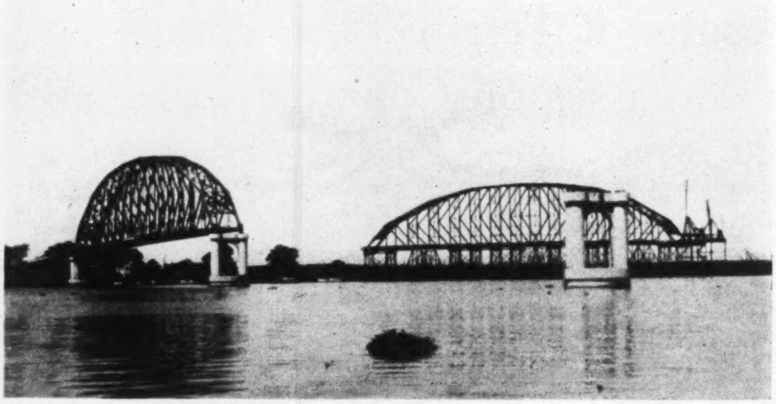


Fig. 1—Crossing of Atchafalaya River at Morgan City, La., is effected by three 608-ft. K-type through-truss spans. View shows foundations complete, one end span in place and the other end span erected ready to be floated into position on barges.

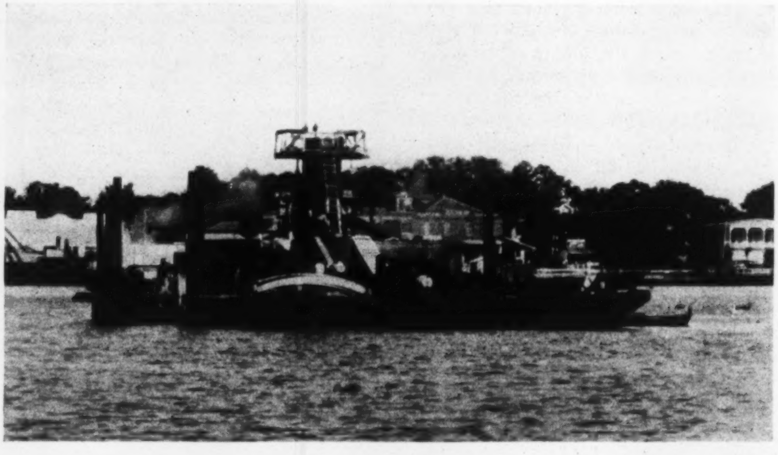


Fig. 2—One of the river piers which was sunk 176.5 ft. below water level. Air was removed when cutting edge reached El.-129. Steel sheetpile cofferdam inclosed the caisson in order to insure still water in the tidal stream.

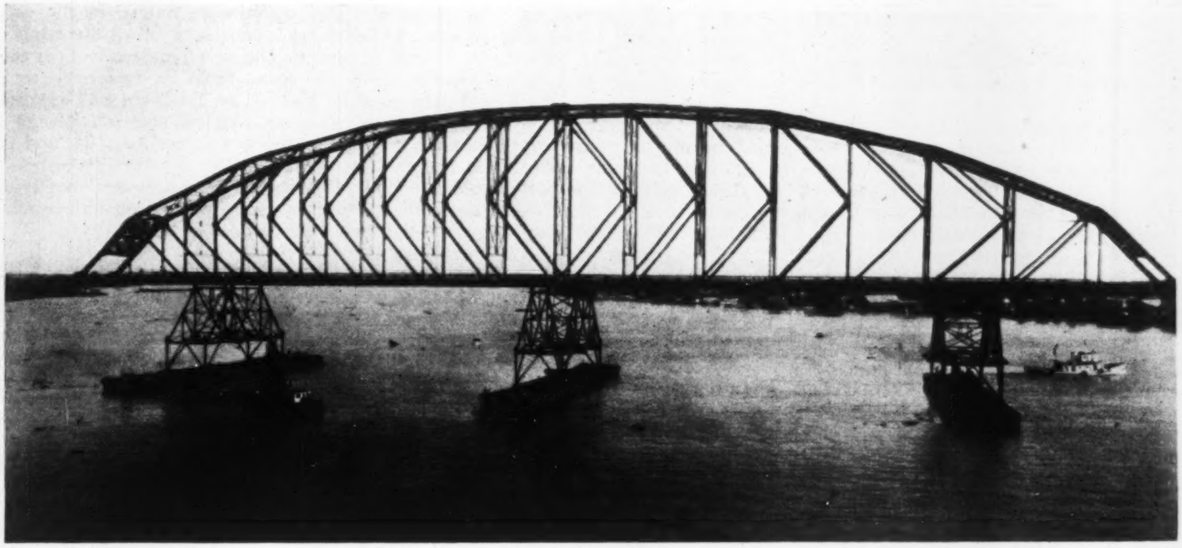


Fig. 3—Floating a 603-ft., 1,350-ton span into position on the piers. Maximum height of bottom chord above water is 58 ft. Spans are 100 ft. deep at the center. Two tugs moved the span to the piers, after which lines operated from engines on the two end barges were used to maneuver it onto the bridge seats.

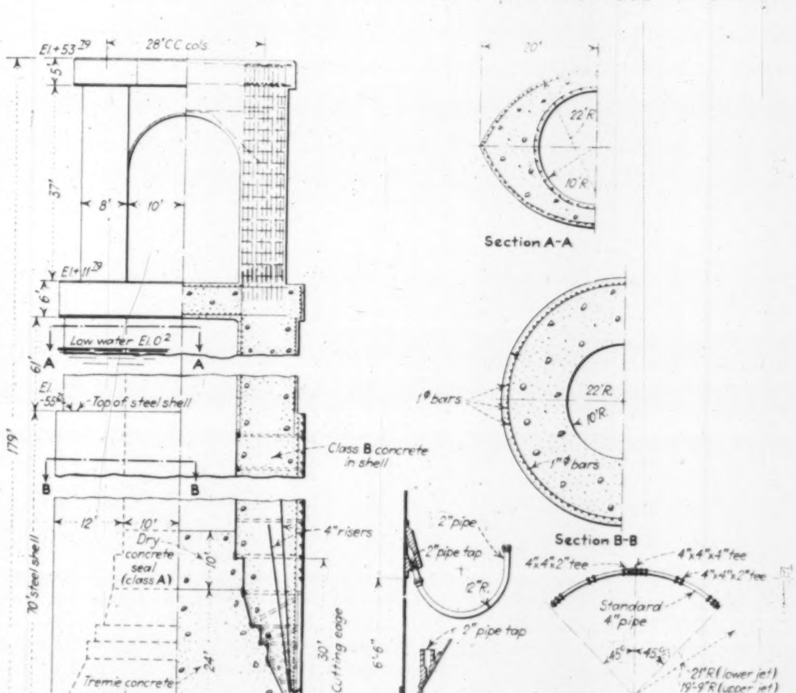
In the early stages of sinking, the very soft river bottom necessitated careful handling of the caissons. The first 12 ft. of concrete sank the cutting edge 23 ft. below water. An additional 16 ft. of shell was then added, and the caisson again concreted. This procedure was repeated until 29 ft. of concrete in the caisson put the cutting edge on top of the silt 53 ft. below water level. With the further addition of concrete, the caisson sunk in this silt to a depth of 45 ft. before the concrete could be brought to the top of the water, this making the caisson 110 ft. high. During these operations the soil was forced up in the inner shaft to such a height that its removal was of very little value in controlling the caisson. Some of this material, however, had to be excavated in order to prevent it from forming a plug in the inner shell and also in order to place the steel deck for the air work. This of course allowed the caisson to settle still further so that the cutting edge had sunk to a point 85 ft. below water before the deck could be fastened and air applied. Very careful handling was required to keep the caisson in position and plumb.

Air excavation was done by blow pipes, and at no time was it possible to go deeper than 15 ft. from the cutting edge. Air was carried on the caisson until the cutting edge was 129 ft. below water level, requiring a pressure of 49.5 lb. per sq.in., which was 6.5 lb. per sq.in. less than theoretically required because of the blanket of clay in the working chamber. Difficulty was experienced in taking air off the caissons because the ground was so soft that with pressure released the mud in the working chamber would rise up to the deck. Finally, water pumped into the working chamber and shaft (as air was released) kept the mud down until the deck could be removed by divers.

The soft mud seemed to have no side resistance whatever, for the caissons would sink vertically even though they were out of plumb. In order to correct the position of a caisson, it was tipped slightly in the direction it had to move so that the center of gravity was brought nearer a point directly over the correct position; then the caisson was gradually leveled up. This method was not attempted until after air was taken off, and then the caisson was so high compared to its base that only slight tipping was permissible if the caisson were to be kept in stable equilibrium. As a consequence, repeated operations were required to bring the caissons to their exact positions.

After the caissons had been open-dredged to suitable bearing material

Fig. 4—Details of pier and 44-ft.-diameter caisson with a 20-ft.-diameter dredging well. The shallower of the two deep piers is shown. Note the jetting-pipe arrangement.


El+53 29
28' CC cols.
5'
37'
8'
10'
El+11 29
6'
Low water El. 0 2
A
A
61'
El -55 21
Top of steel shell
179'
Class B concrete in shell
B
B
12'
10'
Dry concrete seal (class A)
10'
4" risers
70' steel shell
24'
Tremie concrete seal (class A)
30' Cutting edge
Half Elevation
Half Section
20'
22' R
10' R
Section A-A
1" bars
22' R.
10' R.
1" bars
Section B-B
2" pipe
2" pipe tap
12" R.
2" pipe tap
6'-6"
Bottom of cutting edge
Detail of Jets
4"x4"x2" tee
4"x4"x4" tee
4"x4"x2" tee
Standard 4" pipe
45°
45°
21' R (lower jet)
19'-9" R (upper jet)
Piping Details (One Quadrant)
1-4" Riser per Quadrant
Jet Pipe Layout

(a fine sand), the working chambers were cleaned out and the caissons allowed to stand idle for several days for the bottom to settle. A 24-ft. concrete seal was then tremied into the working chamber, and after this had sufficiently set, the 20-ft.-diameter dredging well was pumped dry and a 10-ft. reinforced-concrete seal was placed over the wet seal. The well was then flooded, and the pier capped and completed.

The two shore piers were not so deep. However, they were located on sloping clay of medium stiffness overlaying sand, and had to be handled very carefully to keep them from moving toward the river. They were handled in the usual fashion of tipping them at the top toward the river and gradually letting them come up level.

The river piers to a height of 70 ft. and the short piers to a height of 38 ft. above the cutting edge were built to 44-ft. outside diameter. Above these elevations to the under side of the cap, about 5 ft. above water level, a lenticular section of reduced area was used.

Steel erection

The water under the main spans varying in depth from 30 to 70 ft. and the bottom being 40 ft. of soft mud, very long piling would have been required for falsework, and it would have been difficult to brace the piling properly below the water line. Because of this condition it was decided to build falsework along the west shore of the river, about 400 ft. upstream from the bridge site, erect the spans on this falsework and then float them into place on barges.

Conditions for floating were unusually good. Morgan City is 15 miles from the Gulf of Mexico. Above it are large lakes that act as a reservoir for floodwater, and consequently there is but a small variation in the stages of the river. The total variation during the period of erection was 3 ft. Also there is a tide of only about 9 in. at this point, and during the incoming tide there is practically no current.

The falsework was built in water from 20 to 30 ft. deep, about 90 ft. from the shore, and consisted of three steel towers and six timber towers supported on woodpiling. The steel towers were so built that the weight of the span could be transferred from the wooden falsework to the barges used for floating. Posts connecting the steel towers to the barges were made adjustable to take care of the rise and fall of the river and the varying heights of the bottom chord from the water. These posts had a total adjustment of 17 ft. each and could be adjusted to intervals of 4 in. Two steel towers were also erected to support the traveler and a stiff-leg service derrick. The falsework was built on a grade to suit the end spans.

After these were erected, pony bents were used to make the falsework level, and steel erection began. The steel towers were pin-connected to the bottom chords of the trusses. They were constructed with batter posts so as to apply the loads near the quarter points of the barges and give lateral stability. The shoes of the adjustable posts were bolted to the barges. The barges were held in line by wire ropes extending diagonally from the ends of the barges to the bottom chords of the trusses.

Three steel barges were used for floating the spans. Each barge was 175 ft. long, 26 ft. wide and 11 ft. deep. The weight of one span is 1,350 tons. The distance from the bottom chord to the water was 58 ft. for the middle span and somewhat less for the end spans.

Each span was towed by two tugs from the falsework to near its final position. When near the final position the movement of the spans was controlled by lines extending from the piers to hoisting engines on the end barges. There were also two anchors placed about 1,000 ft. upstream, from which lines were run to the engines on the barges. Telephones were placed on both ends and at the middle of the span and on the two end barges. By this means the superintendent, who was stationed on the sidewalk at the middle of the span, could control the movement of each span from the falsework to its final position on the piers.

The spans were moved in the early morning when there was little wind or current. The time required to float each of the spans from its falsework to its final position on the piers was less than two hours. The first span was placed on July 7, the second on Aug. 24, and the last on Sept. 28.

The deck-truss spans are mostly on shore and were erected on timber falsework by crawler cranes.

Engineers and contractors

The bridge was designed by the Louisiana Highway Commission, N. E. Lant, bridge engineer. The Foundation Co. was the general contractor. S. S. Hammel, general superintendent, Pittsburgh, supervised the work. John W. Hoskinson and Chester W. Cambell were superintendent and engineer, respectively at Morgan City. P. V. Pennybacker was resident engineer for the Louisiana highway department. The Foundation Co. built the foundations and sublet the superstructure to the Mt. Vernon Bridge Co., of which U. Lytle was superintendent of erection and Thomas P. Lewis erection engineer. The firm of Doullett & Ewin, Inc., New Orleans, was the subcontractor on the approaches and the paving.

Planning and Zoning Data Tabulated

FOUR circular letters on city planning, zoning and housing, numbered 369, 370, 371 and 374, have recently been issued in mimeograph form by the U. S. Bureau of Standards, Washington, D. C. The reports were made by Lester G. Chase of the division of building and housing. The first letter relates to city planning and laws in 1932. No new enabling acts were passed in 1932; 35 states already have them. A tabulation shows 806 city planning commissions or boards and 82 regions or counties so served. An unpaid state planning commission has been proposed for Massachusetts to prepare a state master plan that would involve cooperation with municipal planning boards and state officers, boards, commissions and departments. All other city planning and related laws passed during 1932 are noted.

Letter 370 refers to the 82 regional planning organizations, of which there are 23 unofficial. Of the remainder 46 are county commissions. The principal states with regional or county organizations are California (26), New York (13), Illinois (6), New Jersey (5), and Pennsylvania (5). Rural planning is carried out by Wisconsin counties. State planning organizations are official in Wisconsin and Pennsylvania. Several other states, including Massachusetts, Illinois, Iowa and New York, have organizations with restricted activities.

In letter 371 is a tabulation by states of all the city planning boards or commissions, indicating whether official or not, whether services are paid for or not, whether members are appointed, elected or ex-officio and term of office. The total population having commissions is 40,160,000 out of a total of 78,138,000 in the 16,598 communities of the country.

Of the 93 cities over 100,000 in population, 81 have commissions. Of the 283 from 25,000 to 100,000, 162 are provided for. Of the 606 in the 10,000 to 25,000 class, 208 have commissions. In the 5,000 to 10,000 class, 851 cities, 135 are served, and in the 14,765 communities under 5,000 only 220 have commissions. More than 100 cities report curtailed functions due to the depression, and the report makes a strenuous appeal for continuance of this activity as a measure of ultimate economy.

The last circular, 374, is a series of tabulations with reference to zoning of the 1,236 municipalities, representing a population of 48,400,000 in the United States. Forty-one were added in 1932. This activity, especially regulating use, height and area of buildings, has taken place since 1916 when eight zoning ordinances were adopted. All states are represented and all of the large cities. New York state has the largest number, 215, New Jersey follows with 132, California with 113 is third, and Illinois with 93 is fourth. Eight counties and 96 townships have zoning in effect.

Studies of Earthquake Action Promise Better Structures

By James B. Macelwane

Director, Department of Geophysics, St. Louis University, St. Louis, Mo.

UNDER the influence of the movement for more rational study of earthquake effects, initiated by the late John R. Freeman, attention has been directed in recent earthquakes not so much to the buildings and other structures that failed but to the reasons why other structures in the same area did not fail. A report just issued by the New Zealand Department of Scientific and Industrial Research on the disastrous Hawke Bay earthquake of Feb. 3, 1931 (Bulletin 43 of the department, Wellington, 1933) lays stress on the structural design of buildings that withstood the earthquake without serious damage in the midst of others completely wrecked. In the Southern California earthquake of March 10, 1933, side by side with schools and other public buildings that suffered almost total demolition, were buildings in which the damage was slight and even some structures that escaped with no damage whatever.

These earthquakes, like those of Santa Barbara and San Francisco, and in fact all previous earthquakes, were very discriminating in the buildings selected for destruction. They picked out the worst from the standpoint of design, structural materials and workmanship.

It devolves upon the civil engineer to take account of earthquake hazards in the selection of sites for structures. He will not lay an important pipe line or water conduit on an active fault zone unless he is forced by circumstances to do so, and then he will take adequate precautions. But most of the danger in every earthquake is produced by the vibrations and not by the shearing action of the fault.

There are obvious lessons for the engineer in the collapse of trestles carrying conduits and pipe lines, in the fall of buildings, tanks and other structures because of the failure of their underpinning or foundations, in the folding of jointed studding and in the overthrow of curtain walls and parapets. But destructive intensity of vibration is conditioned more by the character of the ground than by the distance from the earthquake fault. Many failures are obviously due more to the lurching and slumping of the loose or water-saturated ground on which the structures were built than to weakness in the structures themselves.

As a result of the present movement among engineers, a new school has arisen which is determined to make buildings as safe against earthquakes as they are against wind storms. For this purpose it is necessary not merely to observe under what circumstances failure occurs, but to find out by experiment what designs and what materials are best suited to resist earthquakes. Experiments of this type are being carried on at a number of engineering schools. The shaking table used at Stanford University is heavy enough to support actual structural units in full size.

We may conclude from the shearing off of vertical columns where they join horizontal members that the horizontal forces were much greater than were allowed for in the assumption of bending moments by the architect and engineer. We may also conclude from the X-cracks in fractured walls that the pendulum motion of the building includes shearing forces beyond those for which the walls were designed. But the magnitude and the characteristics of these movements and their variations with time can only be determined by instruments capable of making continuous records during the earthquake.

In recent years the Japanese, under the leadership of Suyehiro, made a great many measurements of the actual vibrations of buildings with instruments placed near the ground and in the upper stories. But it remained for the present year to obtain such records for actual earthquakes. The United States Coast and Geodetic Survey has undertaken, as a result of the vigorous campaign of the late Dr. Freeman and others, to distribute throughout certain parts of the country, especially California, a large number of instruments capable of measuring with some degree of precision the periods, amplitudes, velocities and displacements of buildings under the influence of earthquake waves. Fortunately, three sets of apparatus were already in operation during the Southern California earthquake last spring.

Records were obtained at Long Beach, Vernon, and Los Angeles. (See N. H. Heck and Frank Neumann, "Destructive Earthquake Motions Measured for First Time," *ENR*, June 22, 1933, p. 804). The origin from which the shock started was about 20 miles southeast of Long Beach in the Pacific Ocean bed off Newport Beach, according to the determinations made by Wood, Gutenberg and others. It is probably the first time that precise measurement of motion was ever made so near the center of a destructive earthquake.

A striking feature of the records is that the vertical movement was comparable to the horizontal motion, and that the acceleration in both these directions reached a maximum value almost one-fourth that of gravity. The Long Beach station was in the basement of the strongly constructed Public Utilities Building, which went through the earthquake undamaged. The Vernon station was in the Terminal Building of the central manufacturing district near Vernon, which is a suburb of Los Angeles. The Los Angeles station was on a platform in the Subway Terminal Building. The maximum acceleration at Vernon was a little more than two-tenths that of gravity. In Los Angeles, where the instruments rested on rock, the accelerations were not greater than 7 per cent that of gravity. The periods of the waves recorded at all three stations were comparable and varied between 0.1 and 3 sec.

Since March many of these instruments have been installed not only in Southern California but also in the neighborhood of San Francisco Bay. Records were obtained in the latter region at the time of the Western Nevada earthquake of June 25, 1933. Two sets of instruments of like construction had been installed in the Bank of America Building in San Jose, one in the basement and the other on the thirteenth floor. The vibrations recorded during the Nevada earthquake were very much greater on the thirteenth floor than in the basement. This result is in entire agreement with the observations of Suyehiro in Japan and with those of Ramspeck in Göttingen, Germany.

Building units act as pendulums and have their own natural period, and they consequently magnify all those vibrations whose frequencies are nearly in resonance with that period. Resonance seems to play a very important part in earthquake damage. Hence it is not sufficient to measure the force or acceleration that is applied to a building during an earthquake. We must also know the periods, the amplitudes, the wave forms and the total duration of the earthquake waves to which it will probably be subjected, as well as the constants of the building to be erected.

Therefore there is imperative need of the type of research that the engineers of the country are now undertaking. But while we are waiting for more precise information, it is the consensus of opinion among seismological engineers that a building must be designed so as to vibrate as a rigid unit securely moored to its foundation. The design of a structure must therefore preclude sustained separate vibrations of any of the parts in accordance with their own resonance. In addition, each story of a building must be given such structural strength as will enable it to resist a horizontal thrust of at least one-tenth the total weight above that level.

Requirements similar to these are being embodied in the new building codes in California, New Zealand, Italy and Japan. Such requirements do not increase the cost of construction unduly. It has been estimated that earthquake

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ABSTRACT of an address before the Engineers Club of St. Louis, Nov. 16, 1933.

Sewage-Treatment Costs at Thirty Illinois Plants

Results of a study of costs of operation of activated-sludge, sprinkling-filter and sand-filter plants—Operation costs found to be affected greatly by local conditions, such as cost of power, plant load and type of sewage treated

By W. Horner Wisely and
Harry F. Ferguson
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DESPITE the enormous volume of reports, records and other information that has been published on the operation of sewage-treatment works, surprisingly few accurate data on the cost of operation are available. Too often information is lacking on the variable factors that would make it possible to compare costs on a sound basis. Most published cost data have been for large plants where adequate records are kept, but even the reports for these plants frequently do not give important variable factors such as unit cost of current, whether the sewage has to be pumped or not and the head against which it is pumped. Information on these items is essential if erroneous conclusions are not to be drawn when comparing operating costs at one plant with those at another plant where the variable factors may be quite different. Further, there has not always been exercised sufficient caution in comparing the operating costs of one type of plant with those of another type, especially when local conditions may have made one type quite suitable for one place but not for another. Consequently some plants may have been misjudged because of unavoidably high operating cost, and claims of better economy at other plants have not always been quite fair.

These considerations combined with the workings of the new sewerage revenue bond and service-charge law in Illinois, which makes it necessary to set up sound estimates of operating costs of sewage-treatment works in order to provide for reasonably accurate and sound service charges in municipal ordinances, have resulted in the study of operating costs of a number of typical plants in Illinois. Effort has been made to present the cost data in reasonable detail in Table I. Notes appended to the tabulation and statements in the text call attention to variable local factors affecting operating costs.

Although the tabulation was made primarily to show operating costs, it was thought advisable to show also the installation costs and the year the plants were built as a matter of general interest, and possibly in some cases to throw some light on operating costs. For example, the installation cost of a sewage-treatment plant might in some places be higher than others in order to obtain a plant that would give lower operating costs.

Operation costs are probably of more

TABLE I—OPERATION COSTS AT SOME TYPICAL

Plant	GENERAL INFORMATION														
			Installation Costs —$				Population					Sewage Flow			
													Total for Period		
	Type Units	Year Built	Const. of Plant	Land	Total	Per Capita [a]	1930 Federal Census	Design [e]	Present Connected	Load Factor %[c]	Period Included in Cost Study Months	Gal. Per Capita Per Day[i]	Primary Treatment m.g.	Complete Treatment m.g.	Kind
Activated Sludge															
Christopher	SS.[a]Am.	1929	39,952	150	40,102	13.37[k]	4,244	3,000	2,600	88	21	105	172	172[e]	S
Princeton	SS. Am.	1927	....	....	67,783	16.95[k]	4,762	4,000	4,000	100	24	119	349	349	S
Woodstock	SS. Am.	1931	92,215	225	92,440	13.21	5,471	7,000	4,500	64	12	158[j]	260	260	S
Sparta	SS. Ad.	1931	57,476	300	57,776	14.44[e]	3,385	4,000[f]	2,400	60	9	74	48	46	SD
Springfield[b]	SS. Ad.	1929	516,000	12,800	528,800	7.05[a]	75,000	75,000[a]	70,000	93	12	110	2,811	2,811	S, C
Sprinkling Filters															
Arlington Heights	Imh. N.	1929	125,000	10,000	135,000	16.88	4,997	8,000	4,800	60	24	261[j]	1,526	1,526	C
Bartlett	Imh. N.	1927	24,795	700	25,495	20.40	504	1,250	150[a]	12[g]	24	905[j]	99	99	SM
Bloomington[b]	Imh. N.	1928	....	....	666,000	12.33	38,000	54,000	35,000	65	24	137	3,502	3,502	C
Carpentersville	Imh. N.	1929	35,008	5,000	40,008	16.00	1,461	2,500	800[g]	32[g]	24	445[j]	260	260	S
Centralia	Imh. N.	1930	164,466	3,300	167,766	11.98	12,583	14,000	10,000	71	21	112	703	400	C
De Kalb[b]	SS. N.	1930	184,816	3,727	188,543	12.57	9,234	15,000	8,200	56	12	130	396	390	SK
Elgin[b]	SS. Imh. N.	1925	477,600	9,000	486,600	12.17	35,912	40,000	35,000	88	24	107	2,730	2,310	C
Galesburg[b]	SS. N.	1931	335,982	11,600	347,582	20.40[a]	29,000	17,000[a]	25,000	147[a]	12	87	790	790	C
Hinsdale[b]	Imh. N.	1930	304,665	37,910	342,575	19.05	9,200	18,000	9,200	51	12	164	552	552	S, C
Homewood	Imh. N.	1927	115,000	5,000	120,000	19.35	3,227	6,200	3,200	52	24	155	361	361	S
Jacksonville—S	Imh. N.	1930	246,442	12,000	258,442	16.18	17,747	16,000	14,500	91	12	121	641	641	C
Jacksonville—N	Imh. N.	1929	150,924	7,000	157,924	14.36	17,747	11,000	5,900	54	12	152	328	328	C
Lake Zurich	Imh. N.	1928	24,700	3,000	27,700	34.63	368	800	600	75	24	98	43	43	S
Marion	Imh. N.	1928	83,976	200	84,176	11.69	9,033	7,200	5,400	75	24	......	......	160	S
Mt. Vernon	Imh. R.	1929	103,000	3,125	106,125	9.83	12,375	10,800	6,500	60	21	185	757	757	C
Naperville	Imh. N.	1931	134,892	12,700	147,592	14.76	5,118	10,000	4,600	46	24	415[j]	1,394	1,394	C
Urbana-Champaign[b]	Imh. N.	1924	472,533	9,546	482,079	10.71	43,912	45,000	39,000	87	12	83	1,059	906	S
Sand Filters															
Ashton	Ts. F.	1917	13,275	500	13,775	15.30	868	900	550	61	24	100	40	40[e]	S
Crystal Lake	SS. F.	1921	41,024	1,500	42,524	25.00	3,732	1,700	3,500	206	24	100	250	250[e]	S
Farmington	Imh, F	1921	37,796	300	38,096	34.65	2,269	1,100	1,100	100	24	100	80	80[e]	S
Mendota—S	F.	1898	....	....	....	....	4,008	1,500	2,500	167	24	120	0	219[e]	SK
Mendota—E	Imh. F.	1920	27,005	800	27,805	21.39	4,008	1,300	800	62	24	96	56	56[e]	S
Sandwich	Imh. F	1913	18,200	600	18,800	25.02	2,611	750	2,100	280	24	120	183	183[e]	SM
West Chicago	Ts. F.	1918	35,850	1,000	36,850	12.30	3,477	3,000	3,300	110	24	91	219	219[e]	S
Wheaton[b]	SS. F.	1926	153,026	10,348	163,374	36.30[a]	8,500	4,500[a]	8,000	178[a]	24	158[j]	924	924	S

Legend

Ad—Activated sludge, diffused air.
Am—Activated sludge, mechanical aerators.
C—Combined sewage.
Clar.—Clarifiers.
Comp.—Air compressors.
D—Rayon dye wastes.
Det.—Detritus tanks.
Dig.—Sludge digestion tanks, mechanical stirring.
F—Sand filters.
Imh.—Imhoff tanks.
K—Cannery wastes.
Lt.—Lighting.
M—Milk wastes.
N—Sprinkling filter, nozzle distribution.
O—Full time operator.
Op—Part time operator.
R—Sprinkling filter, rotary distributor.
S—Sanitary sewage.
Sew.—Sewage.
Sl.—Sludge.
SS.—Separate sedimentation and sludge digestion.
T—Full time technical supervision.
Tp—Part time technical supervision.
Ts—Septic tank.

Notes

[a] Based on design population, which is taken as the capacity of the limiting plant unit. At Springfield the primary units are designed for 90,000 and the secondary units 75,000; at Galesburg the primary units are for 35,000 and the filters for 17,000; at

interest than fixed charges and general administration costs because they are the most variable. The fixed charges on the capital investment may be calculated exactly, since the total plant-installation cost (including any additions, the rate of interest and term of the bonds) is always known. General administration expense must be included in the over-all costs of plants built and operated under the Illinois Sanitary District Act, but this is comparatively small. Where the city owns the plant, general administration cost is negligible from a practical standpoint. Depreciation charges cannot be set up exactly until a plant is scrapped because they are dependent upon the period of service, which is in turn dependent upon numerous local conditions.

A total of 30 representative plants were chosen for study. These have been grouped according to the type of secondary treatment employed.

The information has been taken carefully from the books and records of the municipalities operating the plants, and therefore it is considered as accurate as is possible to obtain. It has been necessary to exercise some judgment in itemizing the expenditures and presenting the unit figures.

Sewage-treatment operation costs are influenced by several basic considerations that must be taken into account when analyzing any one plant or comparing a number of them. Caution must be exercised before criticizing any one responsible for the design or supervision of a plant if certain items of cost seem out of line, as in many instances one or more of these influencing factors may be shown to be the cause of the divergence. It is believed that the most important considerations are as follows: design and arrangement of plant units; the ratio of the population served to the design capacity of the plant, which may be called the plant-load factor; unit commodity prices, particularly power; type and volume of sewage treated; degree of treatment necessary or given.

In presenting the itemized operating costs in the tabulation we have added as general information the data that must be used in analyzing or comparing the figures. The relation of plant arrangement to operating costs is evident when a gravity sprinkling-filter plant, such as that at Mt. Vernon, is compared to plants where pumping is necessary. The per-capita cost figures for Bartlett, where the new sewers have not yet come into general use, reflect the need of considering the plant-load factor. The influence of the price of power is readily seen throughout the table. The difficult industrial wastes at Sparta create a condition which explains increased operation costs. Outlet stream requirements at Urbana have permitted some discharge of sewage, with only primary treatment during high streamflows, with consequent savings in pumpage; this illustrates the effect of the required degree of treatment upon costs.

It was first intended to give detailed information on salary and wage scales, but such details could not readily be presented for all plants, and the range was so slight that such was not really necessary for the plants listed. For the plants designed for less than 10,000 persons the labor costs were nearly always found to comprise the salary of one person responsible for the plant operation and any extra labor employed as needed for special purposes, such as sludge removal, weed-cutting and sand-filter cleaning. Supervision in some instances was provided on a full-time basis, but in the smaller plants supervision of sewage works is part of the duties of the marshal or water superintendent and therefore must be charged accordingly. Extra labor comprises a relatively small portion of the labor expense and is found generally to be obtained at 40 to 50c. per hour.

ILLINOIS SEWAGE-TREATMENT PLANTS

			OPERATION COSTS																	
			Labor[r]			Power					Repairs			Supplies			Misc.[d]			Total	
Use of Power	Sewage Pumping Head-Feet	Supervision	$ Per m.g.[h]	$ Per Capita Year	Per Cent of Total	Kw.-Hr. Per m.g.	Cents Per Kw.-Hr.	$ Per m.g.[h]	$ Per Capita Yearly[i]	Per Cent of Total	$ Per m.g.[h]	$ Per Capita Yearly[i]	Per Cent of Total	$ Per m.g.[h]	$ Per Capita Yearly[i]	Per Cent of Total	$ Per m.g.[h]	$ Per Capita Yearly[i]	Per Cent of Total	$ Per m.g.[h]	$ Per Capita Yearly[i]
Am, Sl. pmp., Clar., Lt.	0	Op	5.03	0.190	21.2	621	2.75	17.08	0.645	72.0	1.15	0.044	5.0	0.44	0.017	1.8	0	0	0	23.70	0.896
Am, Sl. pmp., Clar., Lt.	0	O	8.73	0.380	32.4	475	3.00	14.40	0.630	53.3	2.73	0.120	10.1	1.15	0.050	4.2	0	0	0	27.01	0.980
Am, Sl. pmp., Clar., Lt.	0	OTp	7.20	0.416	44.2	394	2.14	8.41	0.486	51.9	0.54	0.031	3.3	[q]	[q]	[q]	0.10	0.006	0.6	16.25	0.939
Comp., Sl. pmp., Lt.	0	O	14.02	0.363	24.2	1870[l]	2.0	37.58[l]	0.968[l]	64.8	5.89	0.152	10.2	[q]	[q]	[q]	0.44	0.011	0.8	48.03[l]	1.494[l]
Comp., Sl. pmp., Clar., Lt.	0	T	6.27	0.262	47.8	494[p]	0.96	4.74[p]	0.190[p]	36.2	1.26	0.050	9.6	[q]	[q]	[q]	0.84	0.034	6.4	13.11[p]	0.536[p]
Sew. pmp., Lt.	30	OTp	3.80	0.604	46.5	189[m]	2.0	3.78[n]	0.601[n]	46.3	0.13	0.020	1.7	0.47	0.075	5.8	0	0	0	8.18[n]	1.300[n]
Sew. pmp., Lt.	30	Op	7.74	2.56	51.9	180[m]	3.0	5.69[n]	1.37[n]	38.2	0.96	0.32	6.4	0.36	0.12	2.4	0.17	0.05	1.1	14.92[n]	4.42[n]
Sew. & Sl. pmp., Clar., Lt.	21	T	6.52	0.327	61.5	132[m]	2.28	3.00[n]	0.151[n]	28.3	0.13	0.006	1.2	0.78	0.039	7.4	0.17	0.009	1.6	10.60[n]	0.532[n]
Sew. & Sl. pmp., Clar., Lt.	30	Op	3.30	0.536	39.1	219[m]	2.0	4.39[n]	0.713[n]	52.0	0.23	0.038	2.7	0.30	0.049	3.5	0.23	0.038	2.7	8.45[n]	1.374[n]
Sew. & Sl. pmp., Clar., Lt.	26	O	6.36	0.146	51.1	123[m]	4.1	5.04[n]	0.116[n]	40.5	0.33	0.008	2.7	0.54	0.013	4.3	0.18	0.004	1.4	12.45[n]	0.287[n]
Sl pmp., Dig., Clar., Lt.	0	T	10.30	0.490	72.1	55[p]	2.82	1.47[p]	0.070[p]	10.3	0.34	0.016	2.4	0.96	0.046	6.7	1.22	0.058	8.5	14.29[p]	0.680[p]
Sl. pmp., Clar., Lt.	0	T	10.38	0.456	70.7	14[p]	1.75	0.249[p]	0.008[p]	1.7	1.21	0.040	8.2	1.06	0.035	7.2	1.79	0.059	12.2	14.69[p]	0.598[p]
Sew. & Sl. pmp., Clar., Dig., Lt.	27	T	16.91	0.534	70.9	226[m]	1.6	3.63[n]	0.114[n]	15.2	0.52	0.017	2.2	1.04	0.033	4.4	1.74	0.055	7.3	23.83[n]	0.753[n]
Sew. & Sl. pmp., Det., Lt.	33	T	10.08	0.605	54.2	214[m]	2.64	5.67[n]	0.340[n]	30.6	0.13	0.008	0.7	1.40	0.084	7.7	1.24	0.075	6.8	18.52[n]	1.112[n]
Sew. & Sl. pmp., Lt.	30	Op	4.95	0.279	53.0	189[m]	1.89	3.60[n]	0.203[n]	38.6	0.37	0.021	4.0	0.41	0.023	4.4	0	0	0	9.33[n]	0.526[n]
Sew. & Sl. pmp., Lt.	30	OTp	4.61	0.202	51.8	132[m]	1.5	1.98[n]	0.087[n]	22.3	0.10	0.004	1.2	2.10	0.092	23.6	0.10	0.004	1.1	8.89[n]	0.389[n]
Sew. & Sl. pmp., Lt.	16	OTp	9.07	0.504	69.2	106[m]	1.5	1.57[n]	0.087[n]	11.9	0.25	0.014	1.9	2.06	0.115	15.8	0.16	0.010	1.2	13.11[n]	0.730[n]
Sew. & Sl. pmp., Lt.	22	Op	14.50	0.522	68.2	167[m]	2.7	4.50[n]	0.162[n]	21.1	0.36	0.013	1.7	1.79	0.064	8.4	0.14	0.005	0.6	21.29[n]	0.766[n]
Sew. pmp., Lt.	27	Op	8.53	0.253	62.2	138[m]	3.29	4.52[n]	0.134[n]	33.0	0.29	0.009	2.1	0.37	0.006	2.7	0	0	0	13.71[n]	0.402[n]
None	0	O	3.62	0.420	94.4	.....	.....	.....	.....	.....	0.04	0.005	1.1	0.06	0.007	1.6	0.11	0.012	2.9	3.83	0.444
Sew. & Sl. pmp., Lt.	18	O	2.61	0.396	40.5	118[m]	2.75	3.24[n]	0.492[n]	50.0	0.28	0.042	4.2	0.27	0.042	4.2	0.09	0.013	1.1	6.49[n]	0.985[n]
Sew. & Sl. pmp., Clar., Lt.	30	T	10.70	0.249	57.4	185[m]	2.15	3.97[n]	0.090[n]	21.3	0.59	0.013	3.2	2.28	0.051	12.2	1.11	0.026	5.9	18.65[n]	0.429[n]
Sew. pmp., Lt.	11	Op	9.62	0.345	69.6	103[m]	3.0	3.10[n]	0.113[n]	22.4	0.17	0.006	1.2	0.94	0.034	6.8	0	0	0	13.83[n]	0.498[n]
None	0	O	5.26	0.188	75.4	0	.....	0	0	0	1.71	0.061	24.6	[q]	[q]	[q]	0	0	0	6.97	0.249
Lt.	0	Op	14.40	0.521	90.7	.....	.....	1.11	0.041	7.0	0.37	0.014	2.3	[q]	[q]	[q]	0	0	0	15.88	0.576
None	0	O	6.64	0.291	94.8	0	.....	0	0	0	0.13	0.006	1.9	0.13	0.006	1.9	0.10	0.005	1.4	7.00	0.308
None	0	Op	17.10	0.594	78.8	0	.....	0	0	0	4.50	0.156	20.8	0.07	0.003	0.4	0	0	0	21.67	0.753
None	0	Op	12.54	0.546	82.5	0	.....	0	0	0	1.48	0.064	9.8	0.84	0.037	5.5	0.34	0.015	2.2	15.20	0.662
None	0	Op	7.66	0.243	96.9	0	.....	0	0	0	0.11	0.003	1.5	[q]	[q]	[q]	0.13	0.004	1.6	7.90	0.250
Sew. pmp., Lt.	25	O	8.41	0.485	53.3	229[m]	2.0	4.61[n]	0.266	29.3	1.15	0.067	7.3	0.64	0.037	4.1	0.96	0.050	6.0	15.77[n]	0.905[n]

Wheaton the primary units for 10,000 and the filters for 4,500. Of the sand-filter plants, the filters governed the design capacity with an allowance of 1,500 persons per acre.

[b] Sanitary districts organized under law of 1917.

[c] Connected population divided by design population.

[d] Includes telephone, truck, care of grounds, insurance, etc.

[e] Sludge digestors and service building built into old Imhoff tank. Part of old contact beds made into sludge beds.

[f] Plus 35,000 g.p.d. of rayon dye wastes.

[g] New sewer system not yet in general use.

[h] Based on the flow given complete treatment.

[i] Based on connected population.

[j] Heavy groundwater infiltration to sewers.

[k] Old septic tank utilized in new plant as sludge digestor.

[l] High power consumption caused by rayon dye wastes. When only domestic sewage is treated the power consumption is only about 40% of that shown.

[m] Includes power used for pumping sewage.

[n] Includes cost of power used for pumping sewage.

[o] Sewage flow could not be measured or dependably estimated, therefore this figure is not as accurate as other figures.

[p] Does not include power used for pumping sewage on intercepting sewers. Sewage is not pumped at treatment works.

[q] Included under "Repairs." Separate figures not obtainable.

[r] Includes salaries for supervision and laboratory workers as well as plant operators, laborers, etc.

TABLE II — SUMMARY OF RANGE OF UNIT COSTS AND ADJUSTED AVERAGE UNIT COSTS FOR VARIOUS TYPES OF TREATMENT

Type of Treatment	No. of Plants	Unit	Range of Cost Min.	Range of Cost Max.	Adjusted Aver.
Activated sludge (mechanical aeration)	3	Per capita yearly	$0.94	$0.98	$0.93
		Per m.g.	16.25	27.01	24.00
Sprinkling filters, total (all current cost excluded)	17	Per capita yearly	0.17	3.05	0.50
		Per m.g.	3.83	20.21	9.75
Sprinkling filters (sewage not pumped)	3	Per capita yearly	0.44	0.68	0.57
		Per m.g.	3.83	14.69	10.95
Sprinkling filters (sewage pumped)	14	Per capita yearly	0.29	4.42	0.75
		Per m.g.	6.49	23.83	13.85
Sand filters (all current cost excluded)	8	Per capita yearly	0.25	0.75	0.47
		Per m.g.	6.97	21.67	11.90

TABLE III — SEGREGATION OF COSTS FOR LABOR, POWER AND MISCELLANEOUS ITEMS FOR VARIOUS TYPES OF TREATMENT

Type of Treatment	No. of Plants	Percentage of Total Cost Labor	Percentage of Total Cost Power	Percentage of Total Cost All Other
Activated sludge	5	34	56	10
Sprinkling filters (sewage not pumped)	3	79	4	17
Sprinkling filters (sewage pumped)	14	56	32	12
Sand filters	8	86	Negligible	14

At more than one-half of the plants studied it is necessary to pump the sewage either to or at the plant. Because pumping conditions are different in nearly every case, it would have been desirable to list the sewage pumping costs separate from the other power costs, but lack of separate electric meters at most of the plants did not permit this separation. The power costs in the tabulation are especially noted as to whether or not sewage pumping costs are included.

It would be interesting in itemizing expenditures to separate them so that the cost of operation of each plant unit could be determined, as recommended by the Central States Sewage Works Association committee on sewage-works operation and cost records in *Sewage Works Journal, January,* 1932, pp. 12-22. The records available did not permit such separation, and it is doubtful if any plant mentioned, except possibly the very large plants, will ever adopt the detailed bookkeeping necessary to show such separate costs.

The separation between "supplies," "repairs," and "miscellaneous" was at times obscure, and perhaps these items could just as well have been grouped together under a common heading.

The unit costs per million gallons are based on the sewage flow treated. Where there were no facilities for measuring the flow, at some of the smaller plants, the flow was estimated as carefully as possible. Where the sewage is pumped, fairly good estimates could be made.

The unit costs per capita per year are based on the carefully estimated population connected to each plant and may be considered as reliable. When interpreting the per-capita cost figures, the plant-load factor must be considered. The cost of operating a plant will increase somewhat as its load factor increases, but at a much slower rate. The most favorable per-capita cost should be when the plant is serving a population equal to or greater than its design capacity if the plan is capable of handling satisfactorily some overload. Likewise when considering and comparing the cost per million gallons treated, the load factor that influences the volume load should be considered, and for the same reason the most favorable condition should be when the plant is serving a population about equal to its design capacity and is thus handling the volume load for which it was designed.

In considering the total operation costs of the three types of plants, the range of costs, as well as the average costs for each type, are of interest. A mathematical average of costs may be of some value, but if in an attempt to determine an average cost of operation for plants of each type, consideration is given to extreme figures, such as high per-capita cost at Bartlett, where the connected population to the new sewer system is as yet very small, or at Sparta, where strong industrial wastes are involved, there can be obtained what we have termed an "adjusted average cost" which rules out or modifies the effect of extreme cost figures.

The mechanical activated-sludge plants show a range of $16.25 to $27.01 per million gallons and $0.94 to $0.98 per capita yearly. After adjusting to a power cost of 2.5c. per kilowatt-hour and giving consideration to the slightly high sewage flow at Woodstock, general cost figures for this group appear to be about $24 per m.g., or $0.93 per capita yearly.

At the diffused-air plant at Sparta, where it was found that the exclusion of certain portions of the rayon dye wastes resulted in a 60 per cent reduction in power consumption, the total cost of treating the domestic sewage only is $25.50 per m.g. or $0.91 per capita yearly, which is quite in line with the mechanical aeration plants of the same capacity. The diffused-air plant at Springfield shows a favorable unit cost, mainly because of the low cost of power.

Consideration of the sprinkling-filter plants is complicated somewhat by the sewage pumping costs which, at most of the plants, could not be separated from other power costs. In summarizing these figures we have taken the cost ranges, excluding all power costs as well as including them. Without power, sprinkling-filter operation costs range widely, between $3.83 and $20.21 per m.g. and $0.17 and $3.05 per capita per year. The adjusted average is $9.75 per m.g. and $0.50 per capita yearly. Of the fourteen sprinkling-filter plants at which sewage is pumped, the range of total costs is from $6.49 to $23.83 per m.g., $0.29 to $4.42 per capita yearly, and the adjusted average is $13.85 per m.g. and $0.75 per capita yearly. There are only three sprinkling-filter plants at which no sewage was pumped at the treatment works.

Of the eight sand-filter plants, sewage is pumped at Ashton and Wheaton. Because current for lighting is small for any such plant, there is little error if the total power costs are considered as representing sewage pumping costs. In the summary all electric-current costs are excluded. Excluding electric power costs, the range of operating costs for the sand-filter plants is from $6.97 to $21.67 per m.g. and $0.25 to $0.75 per capita yearly, the adjusted average being $11.90 per m.g. and $0.47 per capita per year.

The average costs per m.g. and per capita yearly do not vary in the same proportions for the three types of plants. One reason for this is that, in general, greater flows are handled at the sprinkling-filter plants than at the others because most of the activated-sludge and sand-filter plants treat sanitary sewage only, while most of the sprinkling-filter plants receive combined sewage.

The three major classifications of operating costs are labor (including supervision as well as manual labor), power, (including current for all purposes) and a combined group of all other cost items. In order to compare a classification of these items in the different types of plants, Table III is presented. The percentage given may be visualized as the cents making up each operation-cost dollar.

Another interesting conclusion is that full-time technical supervision at the larger plants and part-time supervision at the smaller plants apparently do not appreciably increase operation costs. This is possible not only because the cost of such supervision is comparatively small as compared with the total operating costs, but also because technical control makes possible more economical operation of sewage-treatment works, while at the same time it makes possible more uniform and better effluents. Thus, with the general advisability and in many cases the necessity of producing continuously the best possible effluents, it would appear that municipal officials should not be afraid of increased operating costs by arranging for good technical supervision, and in some cases they may reasonably expect not higher but lower operating costs, while at the same time assuring better plant effluents and efficiencies.

Structural-Aluminum Practices on the Smithfield Street Bridge

Erection and fabrication procedure for new floor that has been added to the famous Monongahela River crossing at Pittsburgh

SOME 25 years of useful life were recently added to the 51-year-old Smithfield St. Bridge over the Monongahela River at Pittsburgh, Pa., by virtue of a new floor of structural aluminum. The bridge, designed by Gustav Lindenthal and erected in 1882, consists at present of two 360-ft. spans, each involving three Pauli or double-elliptical trusses, each divided into thirteen panels of about 28 ft. A double-track street-car line is accommodated between two of the trusses (upstream) and a highway between the other two.

An examination revealed that these trusses, with some strengthening, could be made adequate for modern loads provided a new and lighter floor were substituted. This floor, of heat-treated aluminum alloy (27 ST type) was described in detail in *Engineering News-Record,* Nov. 23, 1933, p. 611. Floor beams (about 74 ft. long) and stringers are built-up plate girders. The highway floor surface consists of a $\frac{7}{16}$-in. tread-plate topped with $1\frac{1}{2}$ in. of asphalt and supported by 7-in. longitudinal channels spaced about 8 in. apart. Sidewalks outside the main trusses on extensions of the floor beams consist of a $\frac{1}{4}$-in. plate stiffened by longitudinal angles and supported by 6-in. cross-channels between longitudinal stringers.

The following two articles outline the erection and fabrication methods for this unique reconstruction, which was carried out under the supervision of the Department of Public Works of Pittsburgh, Charles M. Reppert, chief engineer. The design of the highway deck slab was developed by engineers of the Aluminum Company of America.

Erecting an Aluminum Bridge Floor

By Henry D. Johnson, Jr.
Construction Engineer for Bridges, Department of Public Works, Pittsburgh, Pa.

TWENTY-FOUR DAYS was the time allotted for the complete replacement of the entire floor system of the Smithfield St. Bridge at Pittsburgh, Pa. To remove all of the existing steel floor beams, stringers and the wooden floor, and to substitute therefor a floor system fabricated of structural aluminum and surfaced with asphalt—all with no interruption whatsoever to street railway or to pedestrian traffic, and an interruption to vehicular traffic of only three weeks and three days—required most careful planning in the design of the proposed reconstruction and a well-organized and scheduled program on the part of the contractor.

In preparing the design, the engineers of the division of bridges and structures of the city kept constantly before them the extreme desideratum of quick erection. The design and fabrication of the aluminum alloy floor beams, stringers and lateral bracing followed the usual structural steel practice, but the sidewalk floor, with stringers and bracing, was shop-fabricated in complete panel lengths. These panels, 27 ft. $7\frac{5}{8}$ in. long and approximately 8 ft. wide, were raised as one unit and put into position. The floor for the roadway section, which was of battle-deck type construction, was also shop-assembled and riveted into sections the length of the panels and 11 ft. wide. Two of these sections completed a panel of roadway floor, with the exception of a 4-ft. space over each floor beam, which was filled in by a field-reamed-and-riveted tread-plate, in order to assure continuity of the floor system at the splices. The fabrication of the individual pieces similar to these would have been impractical with structural steel, because of the weight involved—approximately three times that of aluminum.

As shown in Fig. 1, the bridge has two roadways, one (upstream) for street-cars and one for two lines of vehicular traffic. The design of the Pauli trusses is such that the wind load on the floor system is transmitted to the trusses at the center panels, and to the piers at each end; the floor between the center panels and the piers is supported on hangers which afford no lateral stiffness. It was therefore necessary that the reconstruction work commence at the center of each span and proceed toward one end. This made it impractical to deliver the materials by truck, and a system of barge transportation was developed both for the structural aluminum and the scrap steel that was removed from the bridge.

For erection equipment a hoisting engine was placed at each end of the main spans (Fig. 1), from which hoisting lines were run out to the point of work. Since the greatest weight of any individual piece of old steel was $3\frac{1}{2}$ tons, it was not necessary to reeve up heavy tackle. The main hoisting line was dead-ended by a shackle to the top chord of one truss and carried through a snatch block fastened to the top chord of the other truss, and the load

Fig. 1—Old Smithfield St. Bridge at Pittsburgh, which has been remodeled by a new floor system of structural aluminum. The barges brought the aluminum to the site and carried away the old floor members. One of the two steam boilers and hoisting engines that comprised the erection equipment is shown in front of the portal to the Pauli trust spans.

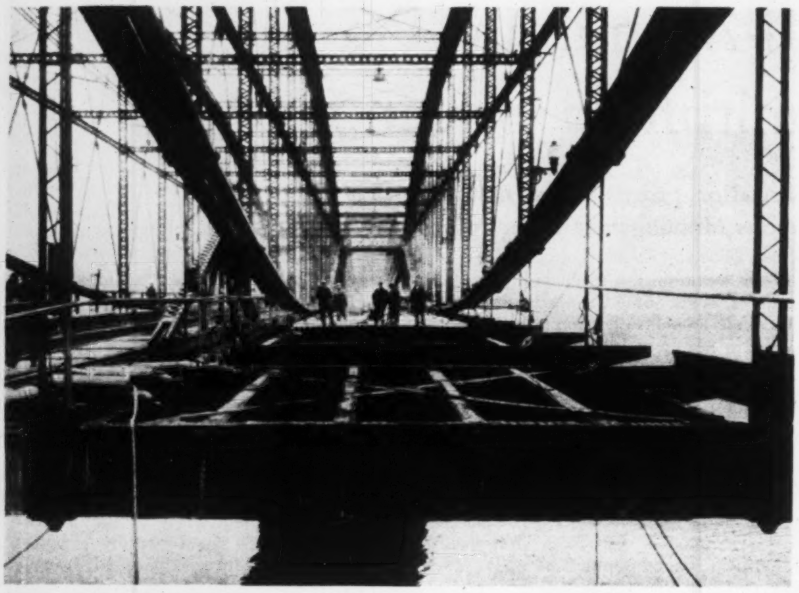


Fig. 2—Erecting the highway half of one of the aluminum floor beams. The hoist lines are operated from an engine at the land end of the span. Note the kingpost truss (on the center line of the bridge), which temporarily supports the railway half of the floor beam that is being erected. Other erection views are shown in a previous article (*ENR*, Nov. 23, 1933, p. 614).

was carried by a running snatch block suspended between the two trusses (Fig. 3). In addition to the main hoisting cable, a $1\frac{1}{4}$-in. manila rope runner was used for handling the lighter pieces and also as an auxiliary hoist on the floor beam, sidewalk and roadway deck sections. Compressed air was furnished by four 220-cu.ft. compressors, two at each end of the bridge. A 100-cu.-ft. receiver was placed at the end of each air line and adjacent to the center pier.

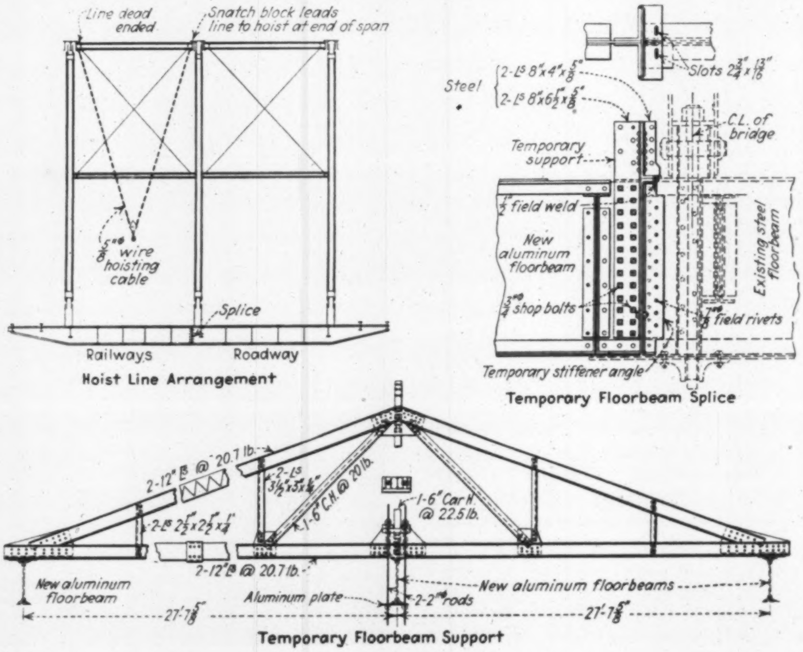
Since it was prescribed in the contract that work should be carried out simultaneously on both spans and should continue 24 hours a day, the job was illuminated at night by the installation of a 300-watt light on the bottom strut of the windbracing at each panel point, by a 1,000-watt portable floodlight on each span, to illuminate the river and barges below, and by several portable spotlights of 100-watt capacity.

The contractor, in organizing his labor forces, provided an erection crew for each span for each eight-hour shift, and as the work required he added fitting-up crews and riveting crews on each shift. In addition to the crews actually working on the two main spans, he kept a utility crew on each shift to do the concrete work on the three piers, to refloor the approaches and to take care of any miscellaneous items that might arise.

Erection of street-car roadway

As soon as automobile traffic was suspended, on the night of Oct. 5, the Pittsburgh Railways Co. laid temporary tracks on the downstream, or roadway side of the bridge, spiking the rails directly to the 11-in. thick wood floor. Rails and ties were then removed from the upstream roadway, and the contractor proceeded to drop all the stringers between panel points 5 and 8 on the railways side, followed by the upstream half of the floor beam at panel point 6, to an empty barge below each span. The structural aluminum floor beam for panel point 6 was then raised into position and temporarily supported by a shop-bolted steel shelf angle at one end (Fig. 3) and by the new permanent U-bolt connection to the east truss at the other end. The floor beam at panel point 7 was then raised, and the new aluminum stringers were filled in between the two panel points.

Fig. 3—Erection details used in placing the structural aluminum floor.



Hoist Line Arrangement

Temporary Floorbeam Splice

Temporary Floorbeam Support

Line dead ended
Snatch block leads line to hoist at end of span
$\frac{5}{8}$" wire hoisting cable
Splice
Railways
Roadway
Steel
2-Ls 8"x4"x$\frac{5}{8}$"
2-Ls 8"x6$\frac{1}{2}$"x$\frac{5}{8}$"
Slots 2$\frac{3}{4}$"x$\frac{13}{16}$"
C.L. of bridge
Temporary support
$\frac{1}{2}$" field weld
New aluminum floorbeam
$\frac{3}{4}$" shop bolts
$\frac{7}{8}$" field rivets
Existing steel floorbeam
Temporary stiffener angle
2-12" [s @ 20.7 lb.
2-Ls 3$\frac{1}{2}$"x3"x$\frac{1}{4}$"
1-6" C.H. @ 20 lb.
2-Ls 2$\frac{1}{2}$"x2$\frac{1}{2}$"x$\frac{1}{4}$"
1-6" Car H. @ 22.5 lb.
2-12" [s @ 20.7 lb.
New aluminum floorbeam
Aluminum plate
2-2" rods
New aluminum floorbeams
27'-7$\frac{5}{8}$"
27'-7$\frac{5}{8}$"

The next step was to lower the stringers between panel points 8 and 9 followed by the floor beam at panel point 8. A new aluminum floor beam was raised and the stringers filled in between floor beams 7 and 8, which procedure was continued to the end of the truss. After the aluminum members had been erected from the center of each span to the center pier, the rigging was moved back to panel point 5, the stringers between panel points 4 and 5 were lowered, and the floor beam at panel point 5 was raised. The procedure for the remainder of the span was similar to the first half of the operation.

As soon as floor beams and stringers had been erected from the center panel to the middle pier, new gangs were employed to fill in the top and bottom laterals and struts and to ream and rivet them. After three or four panels were completed, the railway company began relaying ties and closely followed up the riveting work. While the riveting of the floor system of the railway's half of the bridge was being finished, the contractor erected and riveted the sidewalk sections adjacent to the east truss and placed the $\frac{1}{2}$-in. cold asphalt surfacing. This half of the bridge was then opened to street-cars and pedestrian traffic, its complete rebuilding having required only nine days.

On the highway side, considerable difficulty was experienced in breaking up the old heavy decking, which consisted of one 5-in. and two 3-in. layers

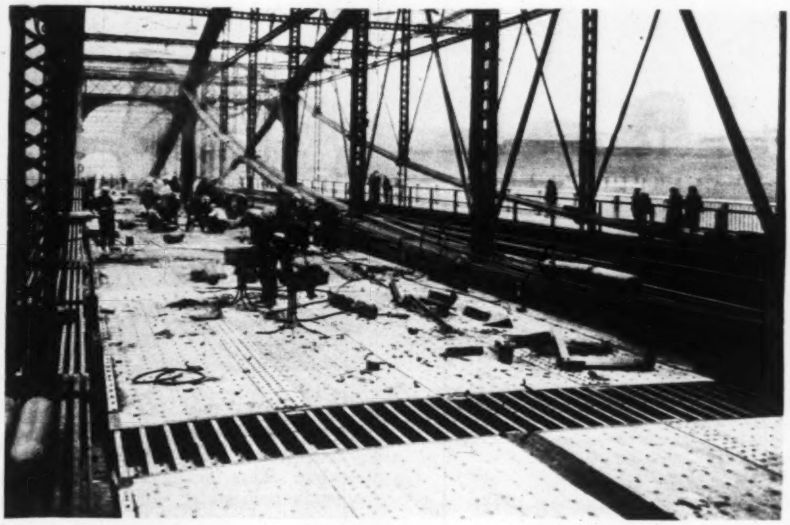


Fig. 4—Shop-fabricated deck panels were connected in the field by longitudinal and transverse splices. Some 37,000 steel rivets were driven in the aluminum floor in four days by fourteen riveting gangs.

of planks. Removal of the old floor system and erection of the new involved the special feature that before one of the old floor beams could be disturbed, the corresponding floor beam on the other side had to be temporarily supported, since the splice was just east of the center truss hanger. To provide this support, a steel kingpost truss, two panels long, was set up, as shown in Figs. 2 and 3, carrying the floor beam by a stirrup detail.

Work on the roadway floor started at panel point 6 of each span and proceeded toward the middle pier. With the railway half of the floor beam supported by the kingpost truss, which spanned from panel points 5 to 7, the roadway half of the floor beam was lowered to the scrap barge. The shop-bolted shelf angles were then removed from the inner end of the railway floor beam, and the highway half of the floor beam was raised from the barge and secured to the permanent U-links on the center and west trusses of the bridge. The web splice was then made between the two halves of the floor beam, care being taken to see that the bottom flanges were in contact to insure continuity. All holes in this web splice were reamed from $\frac{11}{16}$ to $\frac{13}{16}$ in., and the rivets were driven prior to moving the kingpost truss to the next panel point.

While the web splice was being reamed and riveted, the erection crew raised the longitudinal girders, intermediate floor beams and deck panels. When two complete panels of floor were erected, reamers and riveters started on the stringer and floor-beam connections and roadway section splices. As fast as space permitted, additional riveting gangs were added until there were fourteen gangs working (Fig. 4). In four days some 37,000 rivets were driven.

When the last panel of roadway floor was placed, the contractor removed his hoisting engines and rigging, and while the curb guards, scuppers and other minor members were being field-bolted, he leased a derrick boat and placed the west sidewalk panels. Simultaneously, the riveting was being completed on the roadway half of the bridge, and the approach spans were being redecked with 8x10-in. sleepers and 4x12-in. white oak planks. The 1½-in. surfacing of cold-mixed asphalt was placed on the roadway on Oct. 29, and the next day the roadway half of the bridge was opened to traffic—just 24 days after the closing. There remained to be done the riveting and surfacing of the west sidewalk and other minor finishing operations, but these did not interfere with the use of the bridge by all of its normal traffic.

There is no doubt but what with proper organization and planning a similar reconstruction program could be carried out with structural steel, although the fact that the weight of structural aluminum is approximately one-third that of steel considerably facilitated the work. An interesting example of the dexterity with which the aluminum can be handled occurred in the erection of the polished aluminum hand-railing. It was the desire of the engineers that the sidewalk plates on the upstream side be surfaced with asphalt prior to the erection of the hand-railing. Late in the evening of the day before the asphalt surfacing was to be placed, the asphalt subcontractor refused to ask his men to work on the sidewalk of the bridge unless the railing were erected. It was therefore necessary to erect this railing at once. The posts were in place and the panels stored on one approach. In 1 hr. and 8 min. ten men carried the 72 panels of railing out to the bridge and erected them, a feat which could not possibly have been duplicated if a structural-steel railing had been used.

With few exceptions, the author could find no great difference between the erection of the structural aluminum and the erection of similar structural steel. Although the modulus of elasticity of the aluminum is about one-third that of steel, and therefore the individual pieces are more flexible, they do not seem to be damaged from being jostled and handled in the usual manner. It was found that unsound rivets could not be cut out satisfactorily with a rivet buster but that it was necessary to drill a hole through the head approximately the diameter of the rivet, knock off the head with a cape chisel and then back out the rivet. It is, of course, impossible to flame-cut structural aluminum since it is a heat-treated material; and if heated above its critical temperature, it loses a large proportion of its strength. Whenever it was necessary to cope a structural aluminum member, or to cut it for a field adjustment, it was found that this could be done successfully by using a ten-tooth carpenter's saw for long cuts, or by nicking the aluminum along the desired line with a cape chisel and then breaking it off for minor coping.

The contractor for the reconditioning of the Smithfield St. Bridge was Walter S. Rae, of Pittsburgh.

Fabricating Structural Aluminum

By **C. G. Schade**

Chief Engineer and Works Manager, Fort Pitt Bridge Works, Canonsburg, Pa.

THE NECESSITY for erection speed, pointed out in the preceding article, placed three important requirements on shop fabrication: prefabrication of all parts in the largest possible units; accuracy in fabrication, to eliminate delays in the field; rigid adherence to delivery dates. The fact that the upstream half of the floor system was fabricated and erected first (in order to permit uninterrupted pedestrian and railway traffic) was a distinct aid since the design and detailing of this half of the floor was not complicated and enabled the shop forces to become accustomed to the material before work on the more intricate highway floor was started. Careful consideration of the characteristics of the metal also materially expedited fabrication.

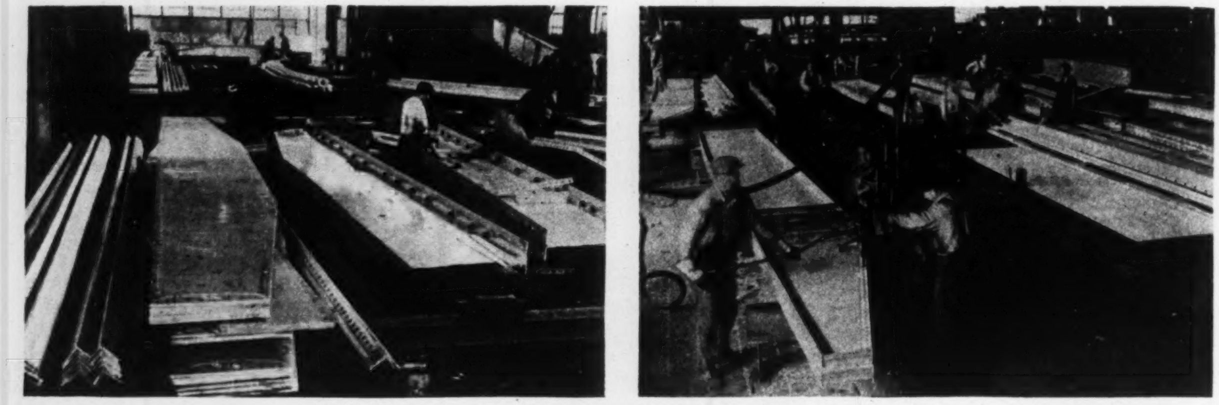


Fig. 5—in the shop the fabrication of aluminum floor beams and stringers followed usual practice. Cold-bent flange angles of $\frac{7}{16}$-in. metal are shown in the background of the left view.

Hot-driven steel rivets were used throughout, and welding or burning of the aluminum was prohibited. Defective rivets were drilled out. The painting procedure called for cleaning with a dilute acid solution followed by a water rinse. Shop paint consisted of an iron oxide-zinc chromate pigment in a bakelite varnish vehicle. In other respects specifications followed those for steel bridge work.

Standard steel equipment and methods were used in the shop. Sharp edges and low clearances on plate and angle shears produced clean cuts. Punching was done on single, rack and automatic spacing machines. Dies and punches, with a radial clearance of $\frac{1}{32}$-in., were kept sharp and well lubricated. Bending was done on horizontal bulldozers. Drilling, reaming, milling and chipping were done with standard tools. A small band-saw, of the type used for hard woods, was employed for coping channels and for trimming the ends of some angles. The $\frac{5}{8}$- and $\frac{3}{4}$-in. rivets were driven with 70-ton squeeze riveters and No. 80 pneumatic hammers. All painting was done with brushes.

In the passage of the material through the shop its light weight was an asset. In the operations of shearing, punching and fitting-up, small pieces were handled with little fatigue to the workmen. Many large items, which would normally be handled by a crane or hoist, were picked up by two men. As an example, 5x3½x7/16-in. flange angles, 27 ft. long, weighed 115 lb. and could be manually handled, while the same angle of steel would weigh 324 lb. and require a hoist. On fabricated aluminum members handled with a crane, the light weight permitted the pieces to be easily swung and guided.

As stated, welding and burning were not permitted. While the band-saw accomplishes operations ordinarily done by burning, prohibition of welding is a distinct handicap, since it eliminates a method of repair for occasional fabricating errors. Surfaces of the plates and shapes were uniformly smooth and clean. The metal was found to take scribe and center-punch marks easily and to be well adapted to layout work. Under the various operations of handling, fitting up and riveting, the metal proved strong and tough. As it was desired to prevent scoring or marring the surface, steel cable protected by rubber hose was used where unprotected chains or hooks would have been utilized in handling structural steel.

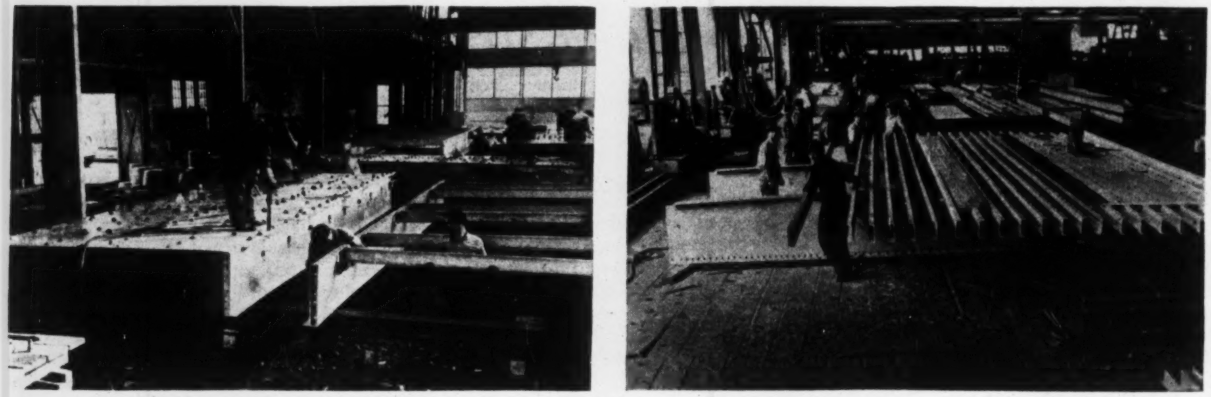
It was found in shearing and punching the tread-plates that the material had to be worked with the diamonds up so that the flat side would be in contact with and entirely backed up by the anvil. The warping effect of punching. This fact is undoubtedly due shapes is negligible. In no case was it necessary to straighten shapes after punching. This fact is undoubtedly due to the combination of high yield point and low modulus of elasticity.

On certain shapes laid out from a wooden templet, there was a noticeable variation in the length of members produced at different times of day. The variations were not sufficiently great to cause trouble in fitting up, but they did indicate that the effect of temperature changes must be considered, since the coefficient of thermal expansion of aluminum is twice that of steel.

For the flange angles on the fishbelly stringers, a bend radius of 3 ft. was specified. The majority of such bends were made cold, although extra workability can be obtained by heating to 400 deg. F. The die on the bulldozer had a radius of 2 ft., and the shape was brought practically down to this radius to obtain a final set on a 3-ft. radius. The modulus of elasticity of aluminum is approximately one-third that of steel so that the deformation to obtain permanent set must be considerably greater. This same characteristic of course tends to aid fitting-up work.

In the machining operations the material cut fast and clean on standard tools. In drilling highway surface plates, six plates were stacked on top of each other, and four drills, lubricated

Fig. 6—Sidewalk panels (left) and roadway panels (right) were completely shop-fabricated. In the view of the roadway panel the floor beams are being used as skids. The loose narrow plate indicates the location of a field splice.



with water and oil, worked at one time. Both rotation and feed speeds were increased, and the operation proceeded about 50 per cent faster than is the case with steel.

Standard buttonhead rivets were used. Best results were obtained with rivets at a bright red heat. At first there was a tendency for the crews to drive slowly for fear of overheating the aluminum, but at one location twenty ¾-in. rivets were driven in quick succession in a space about 9x20 in. and the maximum temperature reached by the aluminum plate, as checked with a two-point pyrometer, was 360 deg. F., demonstrating that normal production speed may be used without danger. As a riveting test, a series of ¾-in rivets was driven through two ½-in. plates, which were then edge-machined to expose the rivet shanks. The holes, which were tapered due to the fact that they had been punched but not reamed, were completely filled, and the steel-aluminum contact was exceptionally tight. In track stringers with ¾-in. steel rivets only 12 out of a total of 18,000 were defective, which demonstrates that there is no inherent difficulty in production-riveting of 27ST alloy.

The cost of aluminum alloy shapes and plate is high in comparison to the standard grades of structural steel. Therefore damage to material because of shop errors is to be avoided. By exercising special care in layout and supervision, loss from this source was practically eliminated on the Smithfield St. Bridge job. The extra time required for checking layout and fabrication operations is offset by increased speed in handling and machining operations, so that the over-all production speed and labor requirements for structural aluminum fabrication are substantially equal to that for steelwork of the same details and dimensions.

Some 330 tons of aluminum shapes and plate were used in the floor system. Fabricating was done during September and October, 1933, in the Canonsburg plant of the Fort Pitt Bridge Works under the direction of the writer and W. F. Berger, general superintendent.

Concrete Vibrator Attaches to Steel Building Frame

IN POURING the cinder-concrete floor arches in the new Philadelphia post-office, a five-story steel-frame structure 370x460 ft. in plan, portable electric vibrators clamped to the beams proved particularly useful and efficient. In addition to eliminating hand-puddling costs, vibration produced a more dense concrete and a smoother exposed surface than was possible on the first two floors where it was not used.

The vibrator is an adaptation of the mortar-flow pulsator used in street-railway track work. The vibratory element consists of an eccentric flywheel driven at about 3,500 r.p.m. by a cog belt connecting to a spring-mounted electric motor. Both the motor and the vibrating unit are carried by a frame that incorporates clamps for attaching the machine to the building beams and girders.

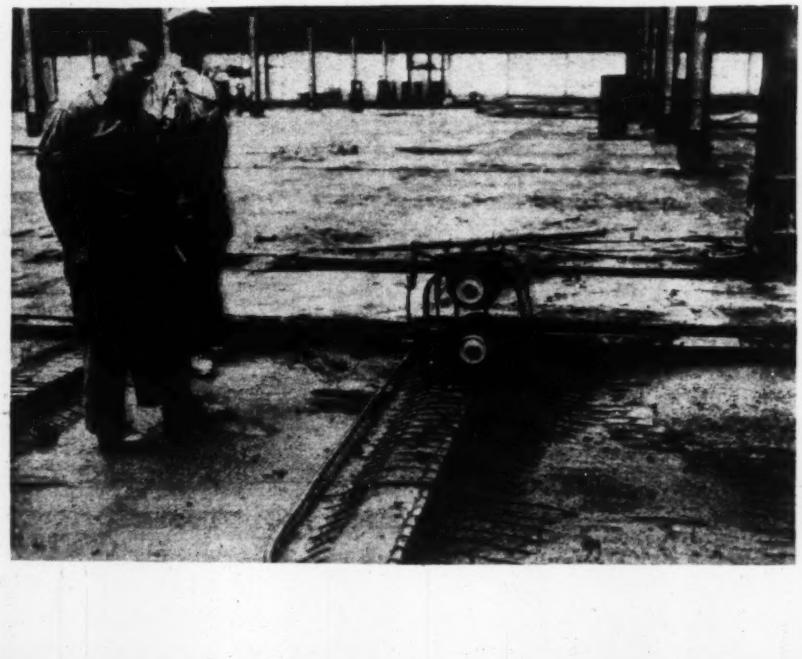


Fig. 1—Vibrator attached to floor beams assisted in placing concrete floor arches and fireproofing in new Philadelphia post-office.

Because the machine vibrated only one beam on the post-office job, it was necessary that it be attached to each horizontal steel member in turn. Column fireproofing below the floor on which the vibrator was working was poured with the girder soffits, and was sufficiently vibrated when the machine was attached to a connecting girder. Concreting procedure was divided into two parts: (1) lower girder flanges, and (2) floor arches. For the girders concrete was poured in to about 6 in. above the soffit forms and then vibrated. The machine worked satisfactorily on girders up to 48 in. deep with two cover-plates. In concreting the floor the cinder concrete was first dumped, without spreading or tamping, into the beam forms and for a partial depth on the flat arch forms. The vibrator was then operated for about 15 sec., following which the concrete required to bring the floor to proper elevation was placed without vibration.

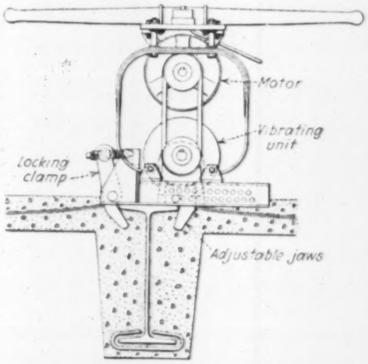


Fig. 2—In the beam vibrator an eccentric flywheel unit is driven by a spring-mounted motor at a speed of 3,500 r.p.m. A vibrating time of about 15 sec. was sufficient to produce a dense concrete closely bonded to the steel.

The Wallin Concrete Corp., of New York, subcontractor for Starrett Bros. & Eken, placed the concrete on the work. The vibrator is a new product of the International Steel Tie Co., Cleveland.

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Disaster Losses in Mexico

Tampico suffered building property damages of 1,190,000 pesos (approximately $345,000), and its neighboring community, Ciudad Madero, losses of 492,000 pesos (about $145,000) from cyclones and floods last September, according to a report of the disaster loss census committee to the Ministry of National Economy. The report points out that these losses do not include damages to furniture, etc., but are exclusively applied to buildings. The committee finds that more than 3,000 dwellings were razed in both cities and that about 2,000 others were partly wrecked.

A Hydrostatic Analogy for Arch Structures

Method of determining moments and deflections of arches through the flotation of a properly shaped model

By H. M. Westergaard
Professor of Theoretical and Applied Mechanics, University of Illinois, Urbana, Ill.

THE STRESSES in a fixed elastic arch, such as is shown by Fig. 1*a*, and its deflections and influence lines, may be determined by considering a piece of wood floating in water. This scheme is closely related to and supplements the column analogy introduced by Hardy Cross (University of Illinois Engineering Experiment Station, Bulletin 215, 1930). Proofs are omitted; they may be supplied by any one of the general methods of analyzing elastic arches.

The floating piece of wood is shown in Fig. 1(b), and will be called the floating arch. Its center line has the same shape as the center line of the original arch but will be in a horizontal plane when the piece is placed in water. The top and bottom of the floating arch are flat. Its cross-sections are rectangular with constant depth but variable width. The width at each point is

$$w = \frac{1}{EI}$$

in which E is the modulus of elasticity in the original arch, and I the moment of inertia of the cross-section of the original arch at the corresponding point. The scale for w must be chosen small. The floating arch will be treated as a rigid body.

The floating arch will be loaded only by vertical forces and by couples contained in vertical planes. The vertical forces may be a distributed load, q per unit of area, positive downward, as in Fig. 1(b), or concentrated forces Q, as in Figs. 2(b) and 3(b). The couples T may be presented by horizontal vectors, as in Fig. 2(d) and Fig. 3(d) and 3(f). These loads cause a tilting of the floating arch. The scales to which the loads are represented must be small enough so that the top of the floating arch remains above the water line and the bottom remains below. The tilting produces additional uplift pressures, p per unit of area, on the bottom.

The external forces q, Q and p and the external couples T produce stresses on the vertical section ABC, which is shown in Fig. 1(c), and which need not be normal to the center line. The resultant of these stresses will be represented by three components: vertical shear v, bending couple m and twisting couple t, with positive directions, as shown by the arrows. The couples m and t are shown as vectors; their resultant is a couple represented by the vector r. If the section is rotated about a vertical axis through B, the shear v and the resultant internal couple r remain constant, but the components m and t change.

The first seven of the following ten propositions apply to fixed arches in which the rib-shortening is small enough to be ignored:

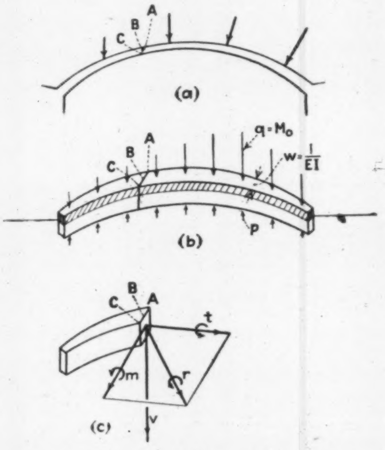

Fig. 1—Original arch (a), and its floating analogue (b), with sketch of the internal forces on a section of the floating arch.

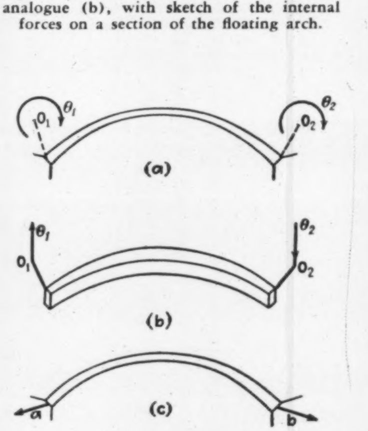

Fig. 2—Abutment rotation and yielding may be represented in the floating arch. The rotations of the original arch shown in (a) are represented in the floating arch by loads as in (b). Abutment yielding as in (c) is represented by twisting couples applied to the floating arch as in (d).

1. Let M_0 denote the bending moments in the original arch due to an arbitrarily assumed reaction at the left abutment and the loads. Let M denote the true bending moments when the abutments have not moved. Then one may write

$$M = M_0 - M',$$

M' representing the needed corrections. These corrections may be obtained by the floating arch. Place the variable distributed load $q = M_0$ per unit of area on the top of the floating arch. When the floating arch has found its new position of equilibrium, the increases p of the uplift pressures on the bottom will be equal to M'. The vertical force $q - p$ per unit of area will be equal to the desired bending moment M.

2. The angle of rotation, positive clockwise, of any section in the original arch in Fig. 1(a), produced by the loads without movement of the abutments, is equal to the vertical shear v in the corresponding section of the floating arch when the floating arch is loaded by M_0.

3. The deflection of any point B of the center line of the original arch in Fig. 1(a) in the direction BC, produced by the loads without movement of the abutments, is equal to the bending moment m in the corresponding section ABC in the floating arch when the floating arch is loaded by M_0.

4. The resultant deflection of point B of the center line of the original arch, produced by the loads without movement of the abutments, is defined in magnitude and direction by the vector r, representing the resultant couple acting on section ABC in Fig. 1(c), when the floating arch is loaded by M_0.

5. When the abutments move, as indicated in Fig. 2(a), rotating through the angles θ_1 and θ_2 about O_1 and O_2, the floating arch will still be loaded by M_0, but in addition by the forces shown in Fig. 2(b). The forces θ_1 and θ_2 are applied at the ends of stiff weightless arms extending above the water to the points O_1 and O_2. Propositions 1 to 4 apply without any other change.

6. When the abutments move in translations defined by the vectors a and b, which are shown magnified in Fig. 2(c), the floating arch will still be loaded by M_0, but in addition by the two couples a and b shown in Fig. 2(d). Propositions 1 to 4 apply without any other change.

7. The bending moment M, the thrust N, and the transverse shear V at point D in the original arch in Figs. 3(a), 3(c) and 3(e), due to a unit load at B in the direction BC, is equal to the bending moment m on section ABC in the floating arch when the floating arch is loaded as shown in Figs. 3(b), 3(d) and 3(f), respectively. The vectors T in Figs. 3(d) and 3(f) are tangential and normal to the center line, respectively. By moving point B, keeping the direction BC constant, one obtains diagrams

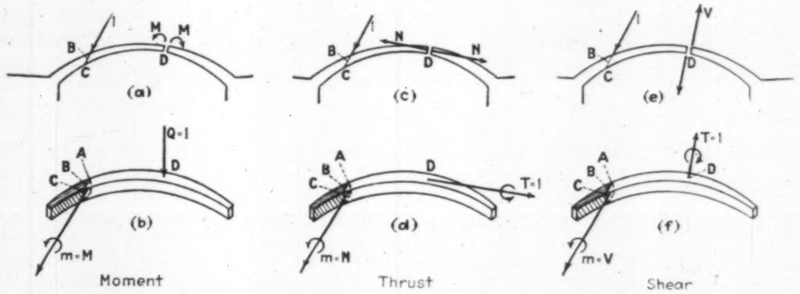

Fig. 3—Influence lines for the original arch are determined from bending moments of the floating arch. To obtain the bending moment M in the original arch, due to a force at section ABC as shown at (a), the floating arch is loaded as at (b), and the bending moment on section ABC then gives the desired moment M. Similar procedure applies to thrust, as shown by (c) and (d), and to shear, as shown by (e) and (f).

of the values of m. These diagrams are the influence lines for M, N and V at point D for loads in the direction BC.

8. When the rib-shortening cannot be ignored, it may be taken into account if the thrusts N are known, or known approximately. Certain couples are to be added to the loads on the floating arch. These couples are of the same nature as T in Fig. 3(d). The vectors representing them are tangent to the center line of the floating arch, and their magnitude is $\frac{N}{EA}$ per unit of length of the center line, A denoting the area of the cross-section of the original arch. Deformations due to the transverse shears may be treated in the same way by adding couples of the type of T in Fig. 3(f).

9. If the fixed arch is replaced by an arch with one, two or three hinges, the floating arch may still be applied. Each hinge will be represented by a simple support at the corresponding point of the floating arch. The floating arch is continuous over each of these supports. Each support maintains the elevation which the floating arch would have at the particular point if it were floating freely without loads. Three hinges will make the original arch statically determinate. The corresponding three supports will fix the position of the floating arch. Then the water will merely support the weight of the floating arch and may be left out of consideration. Three hinges close together near the right abutment would be equivalent to replacing the right abutment by a free end, changing the arch into a curved cantilever. The corresponding three supports of the floating arch are equivalent to a single fixed support, which changes the floating arch into a curved cantilever held at the right end.

10. The procedure that has been described applies to straight beams as well as to arches.

Letters to the Editor

Building Exits

Sir—I have read with much interest two articles by H. B. Houghton and J. H. Courtney on building exits, published in your issues of Aug. 10 and 17. There is no doubt but that the regulations of most building codes are very inadequate for properly regulating exit facilities. The studies reported are valuable in throwing light upon this subject. The articles would be improved, in my opinion, if certain conclusions had been drawn from the information submitted, which could be utilized by engineers, architects and building officials. I believe the articles could also be improved if there had been a general discussion of basic principles covering safe exit regulations.

There are two basic ways of providing safety for the occupants of a building in case of fire or other emergency. One is to provide such exits that the occupants can get out of the building within a certain limited time. In a theater, for instance, such time should be limited to about 2½ min., and in other commercial buildings the time limit should be varied, depending upon the class of building, the rapidity with which it will burn and its height. The other way is to provide inclosed stairs of such number and construction that all of the people in the building can go into the stair inclosure, where they will be safe and can then take such time as will be needed to get out of the building. The latter method is utilized in determining the exits for high buildings. There is a third method that is sometimes made use of in building codes and that may be applied to buildings having very few occupants. This is the requirement that there shall be a stair for so many feet of floor area, the number of feet sometimes being varied, depending on the class of construction of the building, as well as on the occupancy. For buildings with few occupants the width of the stair is not of much importance; it is only important that stairs be available in an emergency, so that escape may not be cut off.

In undertaking an investigation such as that reported, I believe the object should be, as far as possible, to determine the relative efficiency of stairs, inclines, horizontal exits, slides and fire escapes.

The building code of Portland, Ore., which was passed in 1918, prvoides that buildings must have exit facilities that will allow the occupants to make an exit in a certain specified time, varying with the construction of the building, the height of the building, and the occupancy. The time required for making an exit is based on the number of lines of people that can use a stair or incline (and not on the number of people that can be accommodated per foot of width of exit as used in the article); and the capacity of stairs is figured at 30 persons per line per minute passing a given point; or if horizontal exits, at 50 persons per line per minute to pass a given point; and that the rate of speed be 200 ft. per minute walking horizontally, and that the speed for persons going down stairs or inclines be figured at 100 ft. per minute vertical travel. The code was prepared after the available engineering literature on the subject had been consulted and a number of tests and observations of the movement of crowds in buildings in Portland had been made.

Reducing the figures given in the article to a basis of travel per line of stair capacity, it would appear that the slowest travel was 26 persons per minute per line; the fastest travel was 57 per minute per line, in the utilization of stairs. Comparing these figures with those adopted for the Portland code, it would appear that 30 persons per minute per line is quite conservative and that it might be reasonable to raise this figure to 35 or 40.

If exits are proportioned on the basis utilized for high buildings in New York, then calculations for exit capacity are entirely changed and are merely based on the capacity of the inclosed stairs or towers, figuring each person requiring a certain number of square feet for standing room, which is usually figured at about 1½ sq.ft.

It is quite probable that in the future all three of the bases mentioned will be utilized in building codes in providing safe exit facilities, for the reason that there is such a variety in the kinds and uses of buildings that no one basis will apply properly to all.

It is to be hoped that there will be further discussion and study in connection with this very vital regulation for the safety of persons occupying buildings.

H. E. Plummer,
Inspector of Buildings,
City of Portland, Ore.

Portland, Ore.,
Oct. 31, 1933.

Book Reviews and Notes

A Monthly Commentary on Current Additions to the Civil Engineer's Library

Modern Welding Practice

PROCEDURE HANDBOOK OF ARC WELDING DESIGN AND PRACTICE—Flexible fabrikoid; 6x9 in.; pp. 434; line cuts, photographs and tables. Published by The Lincoln Electric Co., Cleveland, Ohio. $1.50.

Prepared for the use of welders, heads of welding departments and contractors, but also containing information useful to the designer, this new "procedure" handbook is arranged in eight sections. Those on the technique of welding and on welding procedure are particularly useful, in providing information on the most modern practices. Extensive treatment is given to elementary design considerations for welded machinery and welded structures. About 500 illustrations and drawings are used.

* * *

George Washington Bridge

TRANSACTIONS—American Society of Civil Engineers, Vol. 97, 1933: Eight papers on the George Washington Bridge across the Hudson River at New York, together with discussions. American Society of Civil Engineers, 33 West 39th St., New York City. $7.

Eight papers descriptive of the various elements of the George Washington Bridge across the Hudson River at New York have been printed, together with discussions, as Vol. No. 97 of the *Transactions* of the American Society of Civil Engineers. The same material, except for the binding and title page, has been published by the Port of New York Authority under the title of "George Washington Bridge." Copies of the latter book are not available for general distribution, but the material contained therein may be obtained from the American Society of Civil Engineers.

* * *

Year Book Thoroughly Revised

THE ENGINEER'S YEAR BOOK, 1933-'34. 40th Annual Issue—Revised under the direction of L. St. L. Pendred, Editor, *The Engineer*. Flexible: 5x7 in.; pp. 2,623; diagrams, tables and halftones. Published by Morgan Bros., Ltd., London. 31s. 6d.

In celebration of the 40th anniversary of the publication of Kemp's "Engineer's Yearbook," the publishers have made a thorough revision and a rearrangement of the 40th edition. Material that is out of date has been eliminated. Illustrations have been revised or replaced, and the tables have been checked and brought up to date. New material has been added on subjects heretofore not dealt with or not adequately covered. The new material includes a monograph on explosives, a section on pump design, including the information on water turbines which draftsmen and engineers need, and a new section on railway permanent way and signaling. Aside from the purely mathematical material and tables, the usefulness of the handbook to engineers in this country is limited by the fact that methods of construction, types of equipment and in some respects construction material vary widely between this country and Great Britain.

A New Type of Structural Handbook

MANUAL OF STRUCTURAL DESIGN—By Jack Singleton. Cloth; 7x10 in.; pp. 196; numerous tables and diagrams. Published by H. M. Ives & Sons, Topeka, Kan. $4.50.

STRUCTURAL handbooks heretofore have been of two types: one a combination of textbook and tabular matter, the other composed almost entirely of tables and graphs. Both types have properly and almost necessarily been a part of every engineer's library. The table-and-graph books have often been grouped with the slide rule as tools of the designer and estimator. As such they have been indispensable. Unfortunately these books have all been compiled with the use of a specific material in mind. Thus there are the well-known structural-steel handbooks, and there are countless concrete designer's manuals. Every engineer has wished at one time or another for a book that would group all necessary design information on these two basic materials within a single cover. But, until Mr. Singleton put the results of a considerable number of years of exacting labor into type, there was no such book available.

The "Manual of Structural Design," according to the author, was prepared "for the engineer who earns his livelihood by working at his profession and was planned to relieve him of as many of the time-consuming tasks of computation as was possible." It begins where textbooks leave off, neither expounding nor explaining theories but consisting almost entirely of working data in the form of tables and graphs on structural-steel and reinforced-concrete design.

The form and contents of a number of the tables and graphs are original with the author. For example, there are some twenty pages of "universal beam tables" applying to reinforced concrete. Given the desired stress, all information for the design of any type of beam or slab is given on one page, for various strengths of concrete and for various values of *n*. Other tables assist in flat-slab design and concrete column and footing proportioning. Graphs aid in problems involving bending and direct stress. The half of the book devoted to structural steel in unusually complete and up to date; properties of all the new standard wide-flanged beams and data for rolled steel slabs, wind brackets, and welded connections are included.

World Power Study

TRANSACTION of the Scandinavian Sectional Meeting and of the First Congress of the International Commission on Large Dams of the World Power Conference, 1933 — Scandinavian Sectional Meeting: Seven volumes; Vol. 1, illustrated chronicle, general reports, resolutions, index, $14; II, electrical energy applications, $14; III, solid, liquid and gaseous fuels, $7.25; IV, power and heat combinations, steam-consuming industries, $12.75; V, iron and steel industry, electric heating, transmission of motive power in industrial plants, $14; railroads, urban and suburban railways, VI, $16; VII, marine transport, $5.25; complete, set, $50.—International Commission on Large Dams: Five volumes; Vol. I, deterioration by aging of concrete in gravity dams, $5.50; II, influence of internal temperature on distortion of gravity dams, $12.50; III, research on materials for earth dams, $7.50; IV, physical laws governing infiltration of water through gravity dams and subsoil, $8.75; V, communications, $2.25; complete set, $22.50; Vols. I, II, III, and IV, $21.25. Distributed in this country by the American Committee, World Power Conference, 1419 Chrysler Building, New York, N. Y. A discount of about 12 per cent on these prices is in effect until Jan. 31.

THE PAPERS before the World Power Conference in Scandinavia during the past summer, and of the associated organization, the International Commission on Large Dams, have been printed in three languages, English, French and German, and are now available in complete sets or separately, as noted above. The individual papers are complete in one of the three languages, at the author's option, with summaries in the other two languages. Forty-two per cent of the individual reports in the transactions of the sectional meetings and 35 per cent of the reports published in the transactions of the commission on large dams are in English. The prices set are the approximate equivalent in dollars to recent exchange rates and may require some adjustment up or down when orders are placed.

The World Power Conference, organized in 1924, holds periodical meetings or conferences. Its first plenary meeting was held in London in 1924, the second in Berlin in 1930, and the third is expected to be held in the United States in 1936. Sectional meetings have been held in Switzerland in 1927, in London in 1928, Spain and Japan in 1929, and in Scandinavia in 1933.

Miscellaneous Notes on Booklets and Reprints

Rigid-Frame Concrete Bridge Design is presented in simplified form in a new booklet published by the Portland Cement Association, Chicago.

Statistics of Motor-Truck Operation in Iowa is the subject of Bulletin 114, Iowa Engineering Experiment Station, Iowa State College, Ames, Iowa.

Seven Years of Council-Manager Government in Kansas City is the subject of a pamphlet published by the Civic Research Institute, 114 West 10th St., Kansas City, Mo.

Cost of Government in New York State, 1900 to 1931, an abstract of a thesis by R. C. Dewey, is among the papers included in Engineering and Science Series No. 43, Studies in the Social Sciences, 1933, published by Rensselaer Polytechnic Institute, Troy, N. Y.

Shrinkage Tables for Softwood Lumber are given in "Technical Notes —No. 241," published by the Forest Products Laboratory, U.S. Forest Service, Madison, Wis. No. 240 of the same series contains 100 definitions pertaining to wood and other forest products.

Tests on Flat-Arch Floor Construction being carried on at the Engineering Experiment Station of Ohio State University are described, and the results so far obtained are analyzed in Bulletin No. 17 entitled "Strength of Flat-Arch Floor Construction: Part 1; End Spans." Copies may be obtained from the Engineering Experiment Station, Columbus, Ohio. Price, 50 cents.

The City, School and County debt requirements for Kansas City and Jackson County for the next ten years, also the probable tax rate, are given in a report prepared by the Civic Research Institute, 114 West 10th St., Kansas City, Mo. The report is the fourth of a group covering (1) trends in city financing in Kansas City; (2) trends in school finance, school district of Kansas City; and (3) trends in county finance in Jackson County, Missouri.

A.S.T.M. Standard Specifications are available in two new books published in October. The book of A.S.T.M. standards, published triennially, is issued in two parts—Part I Metals; and Part II Non-Metallic Materials; each part, bound in cloth, is $7.50 to non-members of the A.S.T.M. and $5 to members, if purchased separately. The respective prices for both parts are $14 and $9. The book of Tentative Standards, published annually, is also available ($7 to non-members and $4.50 to members), from the American Society for Testing Materials, 260 S. Broad St., Philadelphia, Pa. These volumes provide a complete file of the 692 A.S.T.M. specifications, test methods, definitions, etc., as of Sept. 1, 1933.

Design and Construction of Rolled Earth Dams: A reprint of four articles, by R. R. Proctor, field engineer, Bureau of Waterworks and Supply, Los Angeles, Calif., published Aug. 31, Sept. 7, 21, 28, 1933. *Engineering News-Record*, 330 West 42nd St., New York. Price 50c.

New Plans for the Mississippi: the first extended account of activities that modify all the theories and practices that have prevailed for years as the Mississippi flood-control policy. A reprint of a series of eight articles published currently from June 22 to Aug. 10, 1933. *Engineering News-Record*, 330 West 42nd St., New York, N. Y. Price 50c.

Asphalt - Block Construction Methods are described in Manual No. 4, Asphalt Construction, published by the Asphalt Institute, 801 Second Ave., New York. The other manuals are No. 1, Road-Mix Type; No. 2, Surface-Treatment Type; and No. 3, Hot-Mixed Asphalt Pavement (in preparation).

Designing Concrete Pavement Slabs to meet traffic needs is the subject of a new booklet written by Frank T. Sheets, formerly chief highway engineer, Illinois state highway department, and published by the Portland Cement Association, Chicago. Wheel-load requirements, safety-factor limits, pavement life and relative efficiency of various slab designs are discussed.

Data on Low-Cost Housing, etc., is contained in the annual report of the New York State Board of Housing (legislative document 1933, No. 112, available from J. B. Lyon Co., Albany, N. Y.). In addition to pertinent discussion of real estate speculation, slum clearance and opposition to housing programs, the report presents the balance sheets and earning statements of limited-dividend housing organizations that are operating under the state housing law.

A Proposed System for the analysis and field control of fresh concrete is outlined in Bulletin 113 of the Iowa Experiment Station, Iowa State College. The system is based upon the buoyancy principle and is arranged so that the conditions, definitions and apparatus applicable in the course of material proportioning apply equally well to the analysis of the mixed concrete before hardening. Copies may be obtained from the Experiment Station, Ames, Iowa.

All Information relating to the recently modified series of CB steel sections, which will be available after April 1, 1934, is given in a booklet published by the Carnegie Steel Co. It is intended that the booklet be inserted in the Abridged Pocket Companion as a supplement. The changes that are now made in the CB sections are incidental to the program of standardization among all manufacturers of wide-flanged beams. After April 1, 1934, full standardization will have been attained.

New Books and Revised Editions

[*Those desiring copies of the books listed below or mentioned elsewhere in this section should order them from the publishers or from their local booksellers.*]

BEHÄLTER MASTE, SCHORNSTEINE ROHRLEITUNGEN—By B. Löser, V. Lewe, A. Kleinlogel, J. Hingerle and E. Marquardt. Lieferung 5. Paper; 7x11 in.; pp. 60; diagrams and tables. Published by Wilhelm Ernst & Sohn, Wilhelmstrasse 90, Berlin, Germany. 5.50 RM.

CITY MANAGEMENT—By Charles P. Taft. Cloth; 6x8 in.; pp. 275. Published by Farrar & Rhinehart, Inc., New York. $2.50.

CONSTRUCTION MÉCANIQUE: 1934—53 Edition. By J. Izart. Cloth; 4x6 in.; pp. 500 tables and diagrams. Published by Dunod, 92 Rue Bonaparte (IV). Paris. 20 fr.

THÉORIE GÉNÉRALE DU COUP DE BÉLIER—By Charles Jaeger. Paper; 6x10 in.; pp. 268. Tables and diagrams. Published by Dunod, 92 Rue Boneparte, (IV) Paris. 86 Fr. . . . *A theoretical study of water-hammer, including the use of surge basins.*

ELECTRICAL ENGINEERING PRACTICE—By J. W. Meares and R. E. Neale. Volume III, fourth edition. Cloth; 6x9 in.; pp. 920; diagrams, halftones and tables. Published by Chapman & Hall, Ltd. London. 30s net.

DER GRUNDBAU—By L. Brennecke. Lieferung 4 and 5. Paper; 7x10 in.; pp. 79 and 63; diagrams and halftones. Published by Wilhelm Ernst & Sohn, Wilhelmstrasse 90, Berlin, Germany. 5.70 RM and 4.60 RM.

HOW TO DO PUBLICITY—Raymond C. Mayer. Cloth; 6x9 in.; pp. 258. Published by Harper & Bros., New York and London. $3.

THE HYDROGRAPHY OF THE WHANGPOO—Fourth Edition, 1933. General Series, Report No. 10. Paper; 9x12 in.; pp. 80; maps, tables and diagrams. Published by Kelly & Walsh, Ltd. Printers and Publishers, Shanghai, China. $3. (Mex.).

INVENTIONS, PATENTS AND TRADEMARKS—By Milton Wright. Cloth; 6x8 in.; pp. 310. Published by McGraw-Hill Book Co., Inc., New York and London. $2.50.

AN ECONOMIC SURVEY OF MOTOR-VEHICLE TRANSPORTATION IN THE UNITED STATES—Paper; 6x9 in.; pp. 219; tables and diagrams. Published by Bureau of Railway Economics, Washington, D. C. . . . *Motor-vehicle transportation from the railroad man's viewpoint.*

STAU-UND KANALDÄMMEN AUS ERDE UND FELS—By O. Walch. Cloth; 6x9 in.; pp. 234; halftones, diagrams and tables. Published by Julius Springer, Linkstrasse 23-24, Berlin. 22.50 RM.

THE FINANCE MANUAL—By Walter W. Newlund. First Edition. Flexible; 4x7 in.; pp. 274; text and tables. Published by Walter W. Newlund, Pekin, Illinois. $4.

MOUNT WASHINGTON REOCCUPIED—The Experience of a Scientific Expedition Upon the Highest Mountain in New England—1932-33—By Robert S. Monahan. Cloth; 6x9 in.; pp. 270; 2 maps and 48 halftone views. Published by Stephen Daye Press, Brattleboro, Vt. $2.50.

Engineering News-Record

Editor—F. E. Schmitt. Editorial Staff—V. T. Boughton, W. G. Bowman, F. W. Herring, C. S. Hill, H. W. Richardson, W. W. De Berard, N. A. Bowers, J. I. Ballard.

Editorial and Publishing Offices at 330 West 42d St., New York; 520 North Michigan Ave., Chicago; 883 Mission St., San Francisco; Aldwych House, London, England. Subscription price $5 per year in the United States; foreign rates on application.

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1933-1934

ANOTHER YEAR has come to its end, a year quite unlike any of its recent predecessors. When its history is written, there will be found a record of bewilderment, near panic, new vitality. Human history is written in terms like these rather than in figures of electric power or construction contracts awarded. Debility, carrying through from three preceding years, characterized the opening weeks of 1933. This characteristic gradually turned into a black dread of coming events as the spring approached. Complete disaster appeared imminent when business paralysis finally reached the institutions of finance and millions saw their security destroyed. But the crisis was passed. Weakness was its aftermath, but there came also a knowledge that recovery could be effected through the work of man. There followed a most amazing effort on the part of a whole people to work out its own salvation. Measures were devised that bewildered by their numbers and complexities; actions were taken with unprecedented rapidity. Industry, finance, government, commerce, all became part of a national recovery program that grew out of a determination by a society to be the master of its own destiny. We enter 1934 in that same spirit.

The Construction Outlook

CONSTRUCTION with other things has gone through an utterly abnormal year. The paralysis of its principal departments was virtually complete early in 1933. Housing, industrial and commercial construction stagnated, and the slight remaining activity of states, cities and counties was further curtailed by the approach of municipal insolvency. Even federal work faced reduction. With this outlook we forecast last winter that 1933 construction would fall 16 per cent below the previous year, and the event has verified the forecast. It is too early for further forecast, in the face of conditions incomparably more confused. But the outstanding factors of the construction position today are worth notice. They include increased business activity, spread of employment and consequent improvement of tax collections, reviving industrial strength due both to business demand and to code stabilization, and the certainty that the federal re-employment program will be continued. Coupled with these are shortages all along the line of a size that presses for extensive construction at an early date. The recently published estimate of a thirteen-billion-dollar shortage is probably below the mark. That housing is approaching a state of very serious shortage is already widely appreciated, and the industrial construction shortage is hardly less serious. With these basic facts in mind, and remembering also the deterioration of public improvements in their present stagnation, it needs little of the prophetic impulse to foresee early resumption of construction at a rate of activity long unequaled.

Sewage-Treatment Costs

THE remarkable technical advances that have recently been made in sewage-treatment processes have not been accompanied by corresponding improvement of cost-keeping practice, unfortunately. Accounting methods are notoriously poor in most municipal undertakings, but in no other service would improvement yield greater returns than in the rapidly developing field of sewage disposal. For, in the last analysis, the cost of attaining a given degree of purification must be the major determinant in appraising various methods of sewage treatment. Operating costs of full-size installations are rare; few places today can provide such records. For these reasons the article in this issue reporting on the treatment costs of thirty plants in Illinois will prove of great value to every sanitary engineer.

Earthquakes and Tremors

SOUNDLY and informingly Dr. Macelwane summarized in a recent address the essentials of current knowledge of earthquake-resistant construction. In reading his statement, as abstracted in this issue, the structural engineer—and the architect as well—may properly take note of the increasing importance of what may be classed as micro-earthquakes, namely, the shocks and tremors set up by street traffic. Several ancient buildings and at least one modern one that collapsed during recent years are with good reason thought to have fallen victim to these small but widely distributed disturbances; and that the same disturbances affect virtually all city buildings is a matter of daily observation. For resistance to their disrupting influence it is not necessary to invoke the considerations cited by Dr. Macelwane. On the other hand, thorough tying together of the several elements of a structure becomes important, just as it proved to be in the Long Beach earthquake. With effective tying and anchorage, in fact, most structures will prove to be adequate to weather storm, flood and shock.

Shore Surveys

DISCUSSIONS at the meeting of the American Shore and Beach Preservation Association two weeks ago emphasize the money losses caused by shoreline changes during storms and the effect of such changes on the stability of protective works and shorefront structures. It is recognized that knowledge of the nature of shore changes is required before protection can be planned to good effect, but present knowledge is largely confined to the zone above water, as there is little or no information on the corresponding changes offshore. Even the interesting facts on inlet migration along North Carolina beaches presented by Prof. Thorndike Saville cannot be adequately interpreted so long as the changes in the adjoining underwater topography remain unknown. Frequent hydrographic mapping of a zone extending some distance out from shore might throw new light on the nature of shore actions. Since the importance of shore interests well warrants full study of the subject, there is an opportunity for state authorities, perhaps with PWA and federal department aid, to make a fundamental contribution to advance.

Responsibility in Engineering

THE PASSING of T. Chalkley Hatton, long a prominent figure in engineering, recalls to mind the forthright way in which he met the circumstances under which he first came to national note. His action at that time and the subsequent events re-emphasize certain important fundamentals of the engineer's professional obligation.

In September, 1911, a dam above Austin, Penn., failed due to faulty foundation, and caused much damage and loss of life. Hatton, as the designer of the dam, was subjected to severe criticism. In reply to his critics he said in a public statement, after outlining the thoroughness with which he had examined the underlying rock and his reasons for concluding that it was sound:

"The failure of this dam was the result not of poor workmanship but of poor judgment on my part in determining upon the foundation. I should have sought the advice of a man more skilled in determining foundations for dams than I was . . . The owner had no intention at any time of building a dam the safety of which he doubted. He depended upon my judgment entirely, even though he may have tried to influence me to keep the expenditure down to the lowest possible limit."

There were no alibis in that statement, no shifting of responsibility or any attempt to blame the failure on an act of God, but a frank acceptance of the obligation that rests on the engineer in the construction of any important structure. Much is to be gained by restatement and re-emphasis of the principle which he then expressed. For, had a skilled engineering geologist been called in before construction to examine the foundations of the Austin dam or of the St. Francis dam, both doubtless would be standing today. Overconfidence in his own ability often keeps an engineer from calling in a specialist to assist in deciding a vital issue. And sometimes, unfortunately, pecuniary limitations bring about the same result, as when fees have been set so low that the cost of expert advice cannot be incurred. Yet the engineer's steps must always be guided by the consciousness that on him rests the full weight of responsibility for the safety of his structure.

It is therefore also his duty to determine the safe limits of economy measures, and this duty is too frequently overlooked. Many structures could be built without engineering advice, but only at abnormally high cost. Employment of an engineer is justified in large part by the economies in construction that his knowledge makes possible. But, as Mr. Hatton stated, no client knowingly wants to carry economy to the point of building an unsafe structure. The engineer is responsible for advising him as to the point beyond which economy in form or materials must not go.

Especially for the benefit of the young engineer, these two considerations need frequent restatement: First, it is just as much a function of an engineer to know what he cannot do as it is to do well the things that he can do; and, second, an engineer in accepting an engagement also accepts from his client the responsibility for determining the limits of economy in construction.

To return once more to Mr. Hatton: The Austin failure might well have marked the end of his professional career; yet within two years from the time he made his courageous statement he was chosen by a commission headed by George H. Benzenberg to take charge as chief engineer of the great new sewage-disposal plant for Milwaukee. The event demonstrates that a mistake, grievous though it may be, need not destroy or limit an engineer's career; if he meets the issue squarely with clear sight and courage it will be to his own betterment and the mistake may only mark an upward step in his career.

The Coming Year's Task

WHAT the year just closing brought forth will soon be written in the pages of history. Looming large among its great events is the first determined attempt to end unemployment by putting men to work building for public betterment, an attempt which, though inept and confused, is a start along a fundamentally new course and will live long into the future. Even more thoroughgoing in its influence on the economic and social mechanism is the reorientation of industrial system that is now well begun.

Six months have been spent in writing a new constitution for industry. The codes of fair competition that now are largely complete represent a magnificent achievement. Their formulation is the first half of an undertaking which in near perspective appears greater than all that the century so far has accomplished toward industrial organization. The second half of this undertaking—administration of the codes—remains to be done, and this is the big task of 1934.

It is a task of a new kind. Men who until now have devoted themselves to merciless business warfare are called upon to work together in the interests of their entire industrial group. For, the codes are not self-administering. They do not furnish self-government automatically but merely make it possible. Wise and persistent human effort must be given to the task. The issue is a new type of industrial direction through effective self-government, or else reversion to the old jungle system with intensified public control.

The codes themselves are not such as to make the task easy. The NRA's uncertain and changeable attitude, product of its own evolutionary changes, has created many complications. Its numerous contending boards appeared to stand in fear of strong codes. Its vacillation of policy gave to one code a price-fixing clause, to another production control, to another control of expansion, to still another a detailed classification of wage rates, yet it denied the same instrumentalities to most of the codes. But after all, in the administration of the codes their specific terms are likely to prove less important than the methods applied and the fullness of cooperation achieved.

No set rule or routine procedure can suffice to meet these conditions. The measure of cooperation that will be attained lies in the strength of new spirit and the higher order of ability brought to the task. Especially is this so because the objectives of industry self-government are not exclusively selfish. Its purpose is to make each industry a useful part of the community's life, serving other industry and the public as well as itself.

To this end it is essential that the industry become efficient, honest, balanced and stable—qualities that are each more difficult of attainment than the last. Success in such effort can come only through far-sighted planning coupled with knowledge and organizing ability. Business statesmanship of a new order is requisite, in truth; the issue of the year depends on it.

NEWS OF THE WEEK

PWA Allotments Approach Limits of Public Works Fund

A REPORT by Administrator Ickes on the distribution made of the $3,300,000,000 appropriation for public works under the Recovery Act reveals that this fund has been used to finance practically the entire recovery program except the part financed by the Reconstruction Finance Corporation.

Allotments of $2,413,234,727 for federal "projects" include $100,000,000 to the Farm Credit Administration, $300,000,000 for anticipated expenditures of the Civilian Conservation Corps, $400,000,000 for the Civil Works Administration, $4,250,000 for the administrative expenses of NRA, $500,000 for the National Labor Board, and smaller sums to cover expenses of the National Emergency Council, Central Statistical Board, Federal Alcohol Control Administration and other agencies.

Construction loans

Allotments for what properly may be regarded as construction include statutory grants of $400,000,000 to the states for road building, $238,000,000 for naval construction, $50,000,000 to the Tennessee Valley Authority and about $725,000,000 for federal projects authorized by the Public Works Administration.

Against the aggregate of $2,413,234,727 for "federal projects," contracts have been let for $477,987,000 and force account work totals $150,650,000.

Allotments of $658,866,476 for non-federal projects represent about 20 per cent of the total appropriation of $3.3 billions and include $182,808,000 for railroad maintenance and equipment. Of $476,058,476 allotted for state and local projects $236,634,199 is represented by 20 projects such as the New York subway, tunnel and bridge work which account for $100,000,000, and the balance of $239,424,277 is spread over approximately 1,100 projects throughout the country. Pending applications total $3.5 billions.

Although only $227,898,797 of the $3.3 billion appropriation remains unallotted, only $157,767,748 has been disbursed for public works and $42,054,181 for civil works to December 20.

An analysis of the non-federal projects shows that bridges and structures accounted for 28.6 per cent, sewers 21 per cent, waterworks 12.2 per cent, housing 11.3 per cent, streets and highways (other than state highways under the $400,000,000 authorization) 6.1, schools 5.4 per cent, power plants 5.3 per cent, miscellaneous improvements 4.1 per cent, hospitals 2.6 per cent, other buildings 3.3 per cent, recreational facilities 0.1 per cent.

As of Dec. 19, 586 grant agreements and bond purchase contracts had been drawn up and sent to applicants. Of these, 279 had been returned to the PWA executed and 307 were outstanding. The money represented by the latter totals over $50,000,000.

Bridge costs adjusted

An allotment of $470,000 has been made to the Public Belt Railroad Commission of New Orleans by the PWA to enable the commission to comply with the award of the National Labor Board which increased the cost of labor involved in construction of the Public Belt Bridge.

An allotment of $192,000 has been made to the Corps of Engineers for river work in the state of Washington and $18,500 has been allocated to the Geological Survey for the installation of air conditioning apparatus in its map reproduction plant.

New CWA Director for Illinois

Frank D. Chase, recently named chief engineer of the engineering division of CWA in Illinois, has been made executive director of all activities of CWA for Illinois. This move marks a separation of relief work under the Illinois Emergency Relief Commission and reemployment under CWA except for statistical and accounting work which will continue as heretofore by a staff employed by the relief organization.

New Passenger Station Proposed For 18 Chicago Railroads

Consolidation of passenger terminals for 18 railroads in Chicago at Randolph St. on the Lake Front is proposed in an elaborate report presented to Mayor E. J. Kelly by the city council committee on railway terminals of which Edward J. Noonan is consulting engineer. The new plan is the cheapest solution ($19,000,000) of the passenger terminal problem yet proposed. Further it involves comparatively few track changes for any of the roads and has numerous advantages physical and financial both as to construction and operation. These are set forth in the 120-p. report filled with plates and drawings.

Essentially the plan contemplates the abandonment of the Grand Central, La Salle St., Dearborn St., and Illinois Central terminal at Roosevelt Rd. (12th St.) and bringing all of the 17 roads into a 20-track terminal north of Randolph St. on the Illinois Central property. This would free several streets to the south of the Loop district and permit separation of passenger and freight facilities as well as segregate several of the freight terminals. It will also segregate the suburban traffic.

It is planned to hold hearings with officials of the various railroads at an early date and to bring into the picture the governmental coordinator Eastman who is developing operating economies.

Inventory of Real Property To Be Made in 60 Cities by Unemployed

SIXTY CITIES have been selected for the real property inventory recently authorized by the Civil Works Administration. Plans for the survey are well under way and it is expected to have the work completed by Feb. 15, according to Willard L. Thorp, director, Bureau of Foreign and Domestic Commerce, who will supervise the work. A special organization composed of technical men of wide experience has been organized in Washington and the Bureau of Census is undertaking the organization of the field work, drawing men from unemployed professional and technical men and women throughout the country. About 11,000 are to be employed.

Schedules covering the complete range of information to be collected have been prepared for distribution to local enumerators. Included in the information will be data showing the condition of the property with regard to repairs and improvements, the number of vacant properties of both houses and apartments, the number of families that have doubled up because of the depression, the physical character of the structures and the equipment installed. The record also will show the average current rental for comparison with like data for 1929.

The following cities have been listed for inclusion in the survey: In the case of the larger communities the inventory will include the metropolitan districts.

Birmingham, Ala.; Phoenix, Ariz.; Little Rock, Ark.; San Diego and Sacramento, Calif.; Pueblo, Colo.; Waterbury, Conn.; Wilmington, Del.; Jacksonville, Fla.; Atlanta, Ga.; Boise, Idaho; Peoria, and Decatur, Ill.; Indianapolis, Ind.; Des Moines, Iowa; Topeka and Wichita, Kan.; Paducah, Ky.; Baton Rouge, and Shreveport, La.; Portland, Maine; Hagerstown and Frederick, Md.; Worcester, Mass.; Flint and Lansing, Mich.; Minneapolis, Minn.; Jackson, Miss.; Springfield and St. Joseph, Mo.; Butte, Montana; Lincoln, Nebr.; Reno, Nev.; Nashua, N. H.; Trenton, N. J.; Albuquerque and Santa Fe, N. M.; Syracuse and Binghamton, N. Y.; Asheville and Greensboro, N. C.; Fargo, N. D.; Cleveland and Zanesville, Ohio; Oklahoma City, Okla.; Portland, Ore.; Erie and Williamsport, Pa.; Providence, R. I.; Charleston and Columbia, S. C.; Sioux Falls, S. D.; Knoxville, Tenn.; Austin, Dallas and Wichita Falls, Tex.; Salt Lake City, Utah; Burlington, Vt.; Richmond, Va,; Seattle, Wash.; Wheeling, W. Va.; Racine-Kenosha, Wis.; and Casper, Wyo.

Increased Gas Tax Proposed for School Aid in Missouri

The Missouri Senate, on Dec. 21, passed a resolution providing for a state-wide vote on the question of increasing the state gasoline tax from 2 cents to 3 cents a gallon. The extra cent would provide funds for relief of public schools and for the aid of unemployed persons. Under the resolution one-third of the increase would go directly to the schools and the remainder to the general revenue fund from which one-third goes to the public school fund. Thus five-ninths of the new tax would go for school purposes. It is anticipated that the one cent tax will produce $5,000,000.

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Sewage Disposal Plan Advocated For Cities in Rhode Island

Construction of a $19,650,000 sewage disposal system for 18 leading municipalities of Rhode Island was urged upon Governor Green recently in a detailed report of the Metropolitan Sewer Commission. The plan follows the lines outlined in *Engineering News-Record,* Nov. 9, 1933, p. 577. The report touched upon the possibility of reducing the cost to $14,000,000 if prices remain at their present level (10 per cent under 1929 costs) and if a 30 per cent grant of the cost of labor and materials can be obtained from the Federal government under the PWA. It is estimated that $4,800,000 would be required if the main district system costing $14,850,000 is supplemented by lateral sewers in Cranston, Warwick, West Warwick, Lincoln, Cumberland, North Providence, Johnston and Conventry. The sewerage district would include Providence, Pawtucket, East Providence, Woonsocket and a number of other places to be cared for under a centralized authority to be established on a $150,000 appropriation when approved. It is estimated that the project would become self-sustaining in about 20 years.

The suggested financing would be by a system of charges established by the proposed central authority, while residents of towns benefitting from the lateral sewers would pay a small amount for their use. The commission is of the opinion that a proper scale of annual charges would be on the basis of $1.50 per capita for users of the system and $20 per million gallons for industrial wastes. To make the lateral sewers self-sustaining the commission suggested an average service charge equivalent to $1.53 per user per year, assuming that the seven municipalities concerned would bear the cost of operating and maintaining these sewers. On the suggested basis of raising revenue the average annual cost per household in areas now sewered would be $6, and where lateral sewers are to be provided, slightly above $12. The average cost per industry would be of the order of $2,000 for industrial wastes. It is believed that the state itself should bear some portion of the cost of this major improvement.

Stressing the importance of centralization in planning and carrying forward the project the commission states that in no municipality in the state is there a complete and satisfactory solution of the sewage problem now being effected and that at present nearly 200,000 of the 600,000 inhabitants of the proposed district have no available sewer facilities.

M. S. Ketchum Retires as Dean at the University of Illinois

M. S. Ketchum has resigned as dean of the College of Engineering and director of the Engineering Experiment Station at the University of Illinois, Urbana, Ill., and has been appointed research professor of civil engineering at the University. Dean Ketchum has been head of the College of Engineering at the University of Illinois for the past eleven years. He graduated from the University with a B.S. degree in 1895 and received his degree in civil engineering in 1900. From 1895 to 1897 he served as an instructor in civil engineering and mathematics and from 1899 to 1903 as assistant professor of civil engineering. In 1904 he went to the University of Colorado as professor of civil engineering, becoming dean of the College of Engineering the following year and continuing in that position until September, 1919, when he went to the University of Pennsylvania as director of the civil engineering department and professor of civil engineering. He continued in that position until September, 1922.

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Railway to Be Abandoned

The Interstate Commerce Commission has authorized the Tallulah Falls Railroad Co. to abandon its entire line from Cornelia, Ga. to Franklin, N. C., a distance of 57 miles. The road has been in receivership for some time. Its entire capital stock is owned by the Southern Railway Co. and it has been operated in connection with that railroad.

Bids Received for Work on All-American Irrigation Canal

When bids on the first section of the All-American Canal were opened on Dec. 20, the firm of Six Companies, Inc., the contractor for the Boulder Dam work, was low bidder with a bid of $2,769,731.

The work under bid is between Stations 1130 and 1860 along the section of the canal near the international boundary line west of the Colorado River below Yuma. A total of about 4,000,000 cu.yd. of earth and 500,000 cu.yd. of rock is involved. Work is to be carried on under the direction of the U. S. Bureau of Reclamation.

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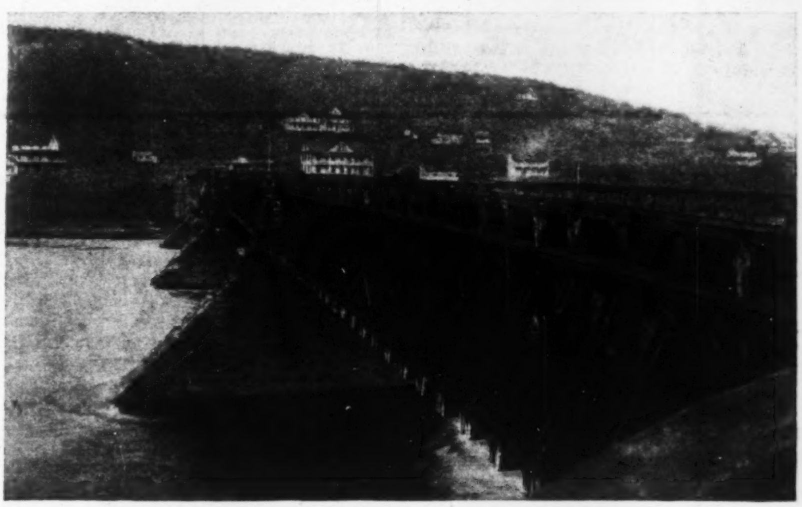
Washington Supreme Court Upholds Bond Invalidation

The supreme court of the state of Washington has upheld the judgment of Pierce County court invalidating a $3,000,000 sewer bond issue voted by the citizens of Tacoma last September. The supreme court held that the August 29 election was a special not a general election, that the statute requiring that in excess of 50 per cent of the total vote at the last preceding general state or county election must be cast at a bond election is valid, and, finally, that the sewer improvement did not constitute an emergency under statutes permitting cities to exceed their debt limits to meet emergencies. The high court held that the "possibility of the city getting 30 per cent of the cost of labor and materials from the federal government and the employment the project would provide for needy families do not make any legal difference."



OLDEST SUSPENSION BRIDGE BACK IN SERVICE AFTER FIRE

Several months ago the flooring of the toll bridge across the Delaware River at Lackawaxen, Pa., owned by the Lackawaxen Bridge Co. caught fire and the flooring on the two spans adjacent to the Pennsylvania side of the river was completely destroyed. The fire was finally stopped at the middle pier of the bridge by tearing up the floor. Repair of the bridge was undertaken immediately under the direction of the Federal Bridge Co.

It is believed that the Lackawaxen bridge is the oldest suspension bridge still in service in the United States. It was constructed in 1847 by John A. Roebling as an aqueduct to carry the Delaware & Hudson Canal across the Delaware River. It is a continuous suspension bridge of four spans of about 132 ft. each. The piers and abutments are of heavy stone masonry. Cables are of parallel wire type, $8\frac{1}{2}$ in. in diameter, each cable containing 2,150 individual wires. The ultimate strength of each cable, as designed, was 1,900 tons. According to P. K. Schuyler, president, Federal Bridge Co., careful examination of the cables and anchorages recently indicated that they have only slightly deteriorated and should be good for many years of service. The above photograph of the old bridge has been made available for publication by L. F. Loree, president, Delaware & Hudson Co.

Explosion in Chicago Sewer Wrecks Section of Arch Ring

Due to an accumulation of explosive gas, a 9-ft. three-ring brick sewer in Chicago on Armitage Ave., east and west of Elston Ave., blew up Dec. 15 fracturing the arch ring for 150 ft. in a depression where the cover was only 1 to 2 ft. The pavement was upheaved for about 600 ft., indicating further damage to the arch. Damage also was done to a brick factory which is in a vacated street near the sewer outlet. The floor of this building was cracked and the foundations displaced. An encroachment on the river of some 50 ft. has been made by a frame storage building over a temporary timber portion of the sewer. The sewer structure here was wrecked but the floor above of concrete appears intact.

While the cause of the explosion is not known the most probable theory is that a large quantity of waste cleaning fluid or gasoline was turned down the sewer and was touched off in some way. Manhole covers were blown off for a mile along the sewer.

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Revenue-Bond Law in Utah Upheld by Supreme Court

The revenue-bond act passed by the Utah legislature in 1932 has been held to be constitutional by the state supreme court in a decision handed down on December 14. The effect of this decision will be to facilitate the consummation of municipal public works projects in that state financed by the federal PWA.

By provision of the state constitution, Utah municipalities have been prohibited from incurring debts "in excess of the taxes for the current year" unless with the approval of a majority of taxpaying electors. Bonded debt is further limited to 12 per cent of assessed value in cities of the third class, 8 per cent in larger cities. An amendment to the constitution was adopted in November, 1932, which was designed to permit cities to adopt home-rule charters, but which also enlarged cities' borrowing powers by allowing the issue of bonds secured by the revenues derived from city-owned utilities. Directly thereafter the legislature passed the so-called Granger Act which for a period of two years authorized the cities to issue and sell revenue bonds for the purpose of purchasing or constructing waterworks systems, sewerage systems, electric power systems and other public utilities. Under the terms of this act the city of Santaquin endeavored to issue $22,000 of bonds under the public works act for improving its water supply system. Taxpayers of the city sought to obtain a court order prohibiting this financing. Among the arguments brought was one that the Granger Act was unconstitutional in that it violated the constitutional limitations on indebtedness.

The court held that the constitutional amendment adopted in November, 1932, provided a legal foundation for the Granger Act. The procedure followed by Santaquin, however, was adjudged improper in that the issuance of the bonds had not been correctly determined. Santaquin, therefore, is prohibited from carrying out its plans, but the constitutionality of the Granger Act is approved.

Highway Users Oppose Diversion of Motor Taxes

AN AGGESSIVE campaign to protect motor transport against excessive taxation and misappropriation of road revenues was launched at a meeting of the advisory comittee of the National Highway Users Conference held in Washington on Dec. 19.

Developments in the motor transport field during the year were outlined to the meeting by Roy F. Britton, director. Mr. Britton particularly stressed the motor tax diversion evil as a result of which more than $100,000,000 of road funds were diverted for other purposes during the year 1933.

Subsequent to a discussion of developments of the past year, the following six-fold program of action for the year 1934 was adopted.

1. Vigorous opposition by the Conference, through its constituent groups, to any and all attempts to use special motor tax revenues for other than legitimate road purposes.
2. Continued nation-wide activity to prevent the further pyramiding of motor vehicle taxation and support for reduction of the burden wherever road conditions may warrant.
3. Opposition to efforts to put commercial highway transport in a "straightjacket" of restrictive regulation and prohibitive taxation in the so-called interest of competitive forms of transportation.
4. Support for the fast-spreading movement to eliminate from the Federal tax structure the discriminatory automotive excise taxes, now amounting to a total of $250,000,000 a year on highway transport.
5. Progressive development of the nation's road system, with the states assuming their legitimate share of the responsibility, as distinct from the current trend on the part of many states to leave it to the Federal Government.
6. An educational compaign to focus attention on the vital importance of highway transport in the economic life of the nation.

Three new members were elected to the Advisory Board of the Conference namely, Axtell J. Byles, president, American Petroleum Institute; William B. Warner, president, National Publishers Association, and Arthur M. Hill, president, National Association of Motor Bus Operators. In addition to these and Chairman Sloan, the following others were present: Ernest N. Smith, American Automobile Association; L. J. Taber, National Grange; Willard Chevalier, McGraw-Hill Publications; C. O. Sherrill, National Chain Stores Association; B. H. Markham, American Petroleum Industries Committee; Herbert P. Sheets, National Retailers' Council; Emory Rice, American Bakers Association; C. E. Childe, National Industrial Traffic League; George E. Clinton, International Association of Milk Dealers and Chester H. Gray, American Farm Bureau Federation.

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Indiana Highway Program

The 1934 program of the state highway commission of Indiana will be the most extensive in the 14 years of its existence with a construction item totalling $18,000,000 in addition to about $6,000,000 for maintenance and other operating expenses, according to an announcement by John W. Wheeler, member of the commission, in an address to the Indiana Highway Contracting Association.

Bids Called for Transit Line on Philadelphia-Camden Bridge

A call for bids for the construction the Philadelphia section of the propose high-speed transit line over the Philadelphia-Camden bridge was authorized by th Delaware River Joint Commission on De 15, bids to be opened on Jan. 15. Th work includes the subway spurs from th bridge approach to 8th and Race Sts. t connect with the Ridge Ave.-Eighth-Locus St. subway, the terminal station unde Franklin Square, widening and lengthening of the vehicle underpass in 5th St. t extend from Cherry to Callowhill St.

It is expected that work on the New Jersey side will be advertised in February

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Reading Prepares to Go Forward with Large Water Project

An engineering board of review consisting of G. Gale Dixon of Youngstown, Ohio, C. A. Emerson, Jr., of New York City, and Farly Gannett of Harrisburg, Pa., recently reported to the mayor and council of Reading, Pa., on the comprehensive program of water works improvements proposed by A. R. O'Reilly, chief engineer of the city bureau of water.

The essential features of the program have been approved and the preparation of details will proceed at once, as the funds needed for the project, which will run about $2,500,000 in total cost, are already available through authorized bond issues and federal grant. The work includes the raising of Ontelaunee Dam to form an impounding reservoir of 3.88 billion gallons content, the construction of an outlet tunnel and 60-in. raw water supply conduit, a complete new rapid sand filter plant with capacity of 20 million gallons daily, a covered reinforced concrete reservoir of 30 million gallons content, and a 2 million gallon steel standpipe.

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Floods Cause Wide Damage In Pacific Northwest States

Heavy rains during the past week, coming close upon a series of storms earlier in the month, have caused wide damage in the states of the Pacific Northwest and across the border in Canada. For a time practically all the rail traffic out of the Puget Sound area was blocked by landslides and washouts and in central Washington and Idaho roads and railways and the low-lying sections of many towns were inundated. For a time the Sunset highway in eastern Washington was blocked and Aberdeen was cut off by high water over the Olympic highway. Many highway bridges were washed out.

In many regions CWA labor, recruited for other operations, was diverted to aid in getting roads open.

As a result of the damage caused by the earlier storms, estimated at several million dollars, county engineers in the Puget Sound area are making a concerted effort to obtain federal aid in flood control work. The King County Commissioners have asked the federal government for funds to complete an engineering survey of the headwaters of the larger streams in the county with a view to adopting a plan of control devised by John Fallgreen, city engineer of Auburn and Kent.

Southern California Communities Vote on Public Bond Issues

A bond issue of $640,000 for the improvement of Newport harbor, Orange county, Calif., was approved Dec. 19 by Orange county voters. The vote was 17,895 yes and 6,282 no. The federal government has been asked to provide $1,194,441 to aid in carrying out the project. It is proposed to construct jetty extensions, dredge the entrance and harbor channels, dredge the anchorage basin and to provide facilities for the accommodation of a large number of pleasure boats.

Voters of Santa Ana, in Orange county, approved a $70,000 bond issue for the construction of a new city hall to replace the one damaged in the earthquake of Mar. 10. A grant of $30,000 from the federal government is to be asked.

Three bond issue proposals in San Bernardino, San Bernardino county, were defeated. They were, $90,000 for park improvements, $10,000 for cemetery improvements and $33,000 for a cross-town drainage system.

Voters of Arcadia, Los Angeles county, defeated a proposal to issue $150,000 in bonds for a new grammar school.

In Burbank, Los Angeles county, two bond issue proposals were defeated. One was for $35,000 for park purposes and the other for $90,000 for sewer system improvements.

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Subsistence Homesteads Planned at Three Separate Sites

Plans for the establishment of subsistence homesteads under the provisions of the Recovery Act in Monmouth County, N. J.; Randolph County, W. Va., and Decatur, Ind., have been announced by Harold L. Ickes, administrator of the Publice Works Administration. In the Monmouth County, N. J., project, homesteads will be provided for 200 families, about 1,000 people, at a cost per homestead of $3,000, including an acre or more of land. Practically all the homesteaders will be selected from among Jewish needle workers in the congested clothing manufacturing area of New York City with a few from New Jersey, Newark and Philadelphia. A factory building to be financed entirely by private funds will be erected in the community which is near Hightstown, N. J.

A loan of $500,000 will be made to a local corporation by the Federal Subsistence Homestead Corporation.

Each purchaser of a homestead will be required to make a down payment of $500 with a purchase contract calling for amortization of the balance over a period of twenty years.

The community in the Tygard River valley near Elkins, W. Va., will provide low-cost homes for about 125 families. Each homestead, including land, is to cost about $2,000. Apparently no down payment is to be required but the cost of the homestead is to be amortized over a period of twenty years. The people for the project are to be recruited from among stranded coal miners, stranded workers in the lumber industry and farmers living on submarginal land along the mountain ridges. The site for the development is near the Monongahela National Park and opportunities for employment are expected to be developed in the forest.

At Decatur, Ind., the project involves a loan of $125,000 to a subsidiary corporation of the Federal Subsistence Homestead Corp. of the P.W.A. From 40 to 48 homesteads will be established and occupants will be selected from among workers ordinarily engaged in a large variety of occupations in order to demonstrate the desirability of subsistence homesteads for a small industrial city.

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Large Water Plan For Central California Gets Approval

THE $170,000,000 California State Water Development Plan was approved by a vote of about 440,000 to 410,000 at a special election held on Dec. 19. Necessitated by a referendum petition, the election confirmed an act, passed by a special session of the legislature last summer, which created the State Water Project Authority and set up the necessary legal machinery to carry out the comprehensive program of water conservation and power development. Application for PWA financing has been on file for some time but has been held up awaiting the result of the referendum election.

The act provides that revenue bonds shall be used for financing. The state administration expects to secure a 30 per cent grant from the federal government and to sell to the government the bonds required to be issued for the remainder of the financing. Plans are being made for organization of the authority and quick action on a PWA application.

The principal features of this state water development program have been outlined in this journal from time to time during the past decade while the engineering studies have been under way. The larger items include: Kennett dam, reservoir and power plant, $84,000,000; Friant dam, reservoir and power plant, $16,000,000; San Joaquin River pumping system, $15,000,000; San Joaquin-Kern canal, $27,000,000; Upper San Francisco Bay fresh water canal, $2,500,000; power transmission lines, $9,600,000.

The program will provide an adequate irrigation supply for some 400,000 acres of land in the San Joaquin River valley now suffering from deficient water supply, eliminate the salt water encroachment in the delta region of the Sacramento and San Joaquin rivers, provide regulation of the flow of the Sacramento River for navigation and flood control.

The act sets up the Water Project Authority consisting of the attorney general, state controller, state treasurer, state finance director and state director of public works (three appointive and two elective) and empowers them to construct and operate the water development project. On the question of the bonds to be issued for financing, the attorney general has ruled that they must be strictly "revenue bonds" in every sense of the term and will be payable only "from the revenues derived from operation of the project, the holder having no recourse for payment to the general taxing power of the state."

J. H. Dowling Named Head of Florida Roads Department

J. H. Dowling, formerly division engineer of plans and surveys of the Florida State Roads Department, has been named chief engineer of the department to succeed B. M. Duncan, who has been named consulting engineer to the department. Mr. Dowling formerly was with the county engineer's office in Jacksonville. He is a graduate of Georgia Institute of Technology.

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TVA to Undertake Development of Aurora Site on Tennessee River

Development of the Aurora dam site on the Tennessee River will be included in the power development program of the Tennessee Valley Authority, according to an announcement made by the TVA on Dec. 15. The Aurora dam site is located in Kentucky about 44 miles upstream from the confluence of the Tennessee and the Ohio rivers at Paducah, Ky. Recently the Southern Industries & Utilities, Inc., a private corporation, applied to the Tennessee Valley Authority for approval of its plan to develop the Aurora site.

Little or no prime power can be developed at the Aurora site because at times of high water in the Ohio River, backwater in the Tennessee would reach nearly to the crest of the proposed dam. In view of this fact, the TVA believes that the Aurora dam can best be integrated with its power plant at Muscle Shoals and at the Joe Wheeler dam, as both of these power plants have their maximum output at times of high water when the lower dam is drowned out.

The TVA statement indicates that work on the Aurora dam will not be undertaken in the immediate future.

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Columbus To Test New Law Postponing Bond Payment Date

Because the financing of needed public works hangs on the constitutionality of the so-called Annat law, passed at the recent session of the Ohio state legislature, the city solicitor of Columbus has filed suit in the state supreme court to test the constitutionality of the law. The Annat law provides that in bond issues for public improvements the payment of principal may be deferred for five years from the date of the first payment of principal. The act was taken advantage of by the city in the preliminary financial arrangements for six projects which it has under consideration, including a sewage treatment plant, interceptor sewers and relief sewers. Under previous Ohio laws the first payment on the principal of the bonds for this work would have to be made on Sept. 1, 1935. Under the new law it can be postponed until Sept. 1, 1940.

The city solicitor has begun mandamus action to compel three members of the city council making up the finance committee to proceed with the financial arrangements for the six bond issues. Apparently there is a conflict between the new law and a provision of the Ohio constitution which requires that levies on real property must be made each year for the retirement of principal as well as interest on bonds.

Detroit Housing Authority Bill Fails to Pass State Legislature

The bill designed to give Detroit permission to set up a housing authority, to utilize funds tentatively promised by the Public Works Emergency Housing Corp. for slum rehabilitation with lowcost housing was defeated Dec. 19 in lower house of the state legislature. The measure received only 41 of the necessary 51 votes. Detroit, it had been hoped, would be the scene of the first housing project of the new federal building plan.

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Cleveland Housing Program Transferred to Federal Body

Because of Cleveland's inability to raise locally the $2,000,000 necessary to match the $12,000,000 federal allotment made last fall for low-cost slum clearance housing, an agreement has now been reached whereby the Public Works Emergency Housing Corp. will construct part or all of the project initiated by Cleveland Homes, Inc. Work will start on a 16-acre area where 3,500 rooms will be provided at a cost of $3,000,000.

A group acting for the limited dividend corporation has asked the Public Works Emergency Housing Corp. to consider a supplemental agreement that would provide that the project although owned by the federal corporation would be operated "under such policies and at such rentals as shall not be inconsistent with a return to private ownership, or likely to be prejudicial to carrying out such a purpose." As first planned the project was to provide rentals of from $8.00 to $8.50 per room. Lower figures, it is said, may be achieved by the federal corporation.

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State Planning Commission Appointed for Illinois

A State Planning Commission for Illinois to co-operate with the National Planning Board set up by the Public Works Administration and with the planning commissions of other states has been appointed by Governor Henry Horner. The commission is appointed by authority of a resolution adopted at the last regular session of the Illinois General Assembly. Robert Kingery, director of the Department of Public Works and Buildings, has been named chairman of the commission. The membership includes four other representatives of the state and eleven citizen members.

The program outlined for consideration by the commission by Director Kingery includes preparation of a general zoning plan for land in Illinois and a study of agricultural trends within the state, study of state park sites for the preparation of an aggressive plan for state-wide recreation, investigation of sites for extension of state forest, fish and game reservations, a study of the streams of Illinois and the preparation of plans for controlling water levels, cleaning streams and improving their flow characteristics, a review of the state road program, a survey of needs of the public institutions and completion of the mapping of the state. Under the stream sanitation work it is hoped to lay down a definite plan for rapid elimination of the pollution of streams by municipalities and industrial plants.

SOCIETY CALENDAR

ASSOCIATED GENERAL CONTRACTORS, annual convention, Washington, D. C., Jan. 29-31, 1934.

AMERICAN CONCRETE INSTITUTE, Toronto, Ontario, Canada, Feb. 20-22, 1934.

AMERICAN RAILWAY ENGINEERING ASSOCIATION, Chicago, Ill., March 13-14, 1934.

AMERICAN ROAD BUILDERS ASSOCIATION, annual convention, Chicago, Jan. 22-26, 1934.

AMERICAN SOCIETY OF CIVIL ENGINEERS, annual meeting, New York, Jan. 17-20, 1934.

AMERICAN SOCIETY FOR TESTING MATERIALS, Atlantic City, N. J., June 25-29, 1934.

AMERICAN TOLL BRIDGE ASSOCIATION will hold its annual convention at Cincinnati, Ohio, Jan. 26-27, 1934.

AMERICAN WOOD PRESERVERS ASSOCIATION, Houston, Texas, Jan. 23-25, 1934.

CANADIAN CONSTRUCTION ASSOCIATION, Toronto, Ont., Jan. 22-26, 1934.

ENGINEERING INSTITUTE OF CANADA, 48th annual general meeting, Montreal, Que., Feb. 8-9, 1934.

VICTORIA BRANCH Engineering Institute of Canada, at its annual meeting elected as chairman Hamilton L. Swan. Other officers elected were: vice-chairman, George Phillips; secretary-treasurer, S. C. Barltrop.

NASHVILLE ENGINEERING ASSOCIATION on Dec. 18 elected officers for 1934 as follows: Malcolm Williams, president; Charles Hawkins, vice-president; Harry Dyer, treasurer; also two new directors, W. A. Coolidge and B M. Turner.

NORTHERN NEW JERSEY CHAPTER, American Society of Safety Engineers, held its annual meeting on Dec. 14, 1933, at Newark, N. J. Elected as officers for the year 1934 were: chairman, H. F. Gilbert; vice-chairman, R. W. Black; treasurer, Fred M. Rosseland, and secretary, Homer Steiner.

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Brief News

CONSTRUCTION WORK on the southern unit of the Grand Island bridges at Buffalo, N. Y., has progressed to the point where arrangements are being made to sink the caisson for the first of the river piers.

AFTER FOURTEEN YEARS in the same quarters at 1315 Spruce Street, Philadelphia, the American Society for Testing Materials has moved its headquarters to 260 South Broad Street, where it has enlarged space and facilities.

THE FIRST SINGLE HOUSES in the country to be constructed under a housing loan from the Public Works Administration fund were begun on Dec. 14 in Cleveland. The work is being undertaken by the Euclid Housing Corp., in Euclid Park.

EXTENSIVE ADDITIONS to the St. Louis steel service plant of Joseph T. Ryerson & Sons are under way. The new structures are notable in that they are to be equipped with air conditioning to protect the products from atmospheric changes.

A CONCESSION TO CONSTRUCT and operate a passenger and freight steam railroad between Zitacauro, Michoacan state, and El Salitre de Urendia, Mexico state, a distance of 34 kilometers, the building cost of which is approximately $124,750, guaranteed by the federal government's National Mortgage and Pulbic Works Bank has been applied for by a syndicate composed of Mexican capitalists headed by Jesus Zermeno. The syndicate promises to have the line completed and in service within 18 months from the date of the granting of the permit. As well, the National Railways of Mexico are negotiating with the federal government for a substantial though unspecified subsidy to finance the completion of a short line between Mexico City and Tampico.

CONSTRUCTION OF A BRIDGE across the entrance to Vancouver harbor at a cost of $6,000,000 has been approved by the voters of Vancouver, B. C. The bridge is proposed to be built by private capital as soon as approval of the Dominion Government can be obtained.

A TEST SECTION of the open-mesh steel deck is to be installed on the Queensboro bridge at New York. The open mesh deck is to be in a 200-ft. section at the east end of the bridge where on account of the steep grade many serious accidents have occurred due to skidding in wet weather.

ONLY ONE BID WAS RECEIVED on the proposed work of widening 1½ miles of East 2d St. in Jamestown, N. Y. when bids were opened recently. The Southern Tier Construction Co. bid $65,584 as against the estimate by the state engineering department of $73,444. The work is to be financed with PWA funds.

CONTRACT FOR DREDGING 2,230,000 cu.yd. of material in the widening and deepening of the Sabine-Neches ship channel from Smith Bluff to Beaumont, Texas, has been awarded to the Standard Dredging Co. of New York on a bid of $255,781. The work is being carried on under the U. S. District Engineer at Galveston, Texas.

A JUDGMENT of $15,000 was awarded to J. B. Betts, contractor of Paris, Ky., by a jury in the Franklin County Circuit Court on Dec. 9 in his suit against the Kentucky Highway Commission for $30,000 for failure to provide a detour while he was constructing a 7½-mile stretch of road between Round Tree and Mt. Vernon. Traffic passing through, he claimed, interfered with the work and tore up work partly completed.

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Personal

JOHN J. POWER, contractor of Worcester, Mass., and vice-chairman of the state recovery board, has been appointed superintendent of all CWA construction work in Massachusetts.

HERMAN H. SMITH, chief engineer of the Board of Estimate of New York City, has made application for retirement. Mr. Smith began his city service in 1903.

S. I. ZACK, for ten years in the engineering department of the Sanitary District of Chicago and more recently at Detroit, Mich., with E. W. MacKenzie on the Laughlin Process of sewage disposal, has been engaged as sanitary engineer on sewage and industrial and waste disposal problems by the Filtration Equipment Corporation, New York City, subsidiary of the American Cyanamid Company.

LELAND L. GRAHAM, graduate engineer of Cornell University and formerly chief engineer for H. K. Ferguson Co., Cleveland, O., has been appointed director of public works in Jamestown, N. Y. During the World War, Mr. Graham was assistant engineer at Camp Knox, Ky., having charge of the construction of a reservoir and filter plant. He supervised the erection of the $12,000,000 plant of the Western Electric Co., at Baltimore. For many years he was a member of the firm of Chapman and Graham.

E. E. Parker, formerly city engineer of Madison, Wis., for many years and recently employed by the Wisconsin State Highway Department to supervise the Federal work on city streets has been appointed acting state highway engineer, a position left vacant by the recent death of John T. Donaghey. The position is under civil service and will require an examination (expected now early in January) before a permanent appointment can be made.

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Obituary

Woodward E. Murkland, a contractor at Springfield, Mass., from 1891 to 1913, died on Dec. 20 at Weston, Mass., at the age of 85. He was a native of Newburyport, Mass.

Samuel Davies Scott, an engineer of the North Carolina State Highway Department, died Dec. 15 in Raleigh, N. C., at the age of 63. Mr. Scott was a graduate of the Virginia Polytechnic Institute.

Abram W. Wolf, retired engineer, died Dec. 19 at his home in Pasadena, Calif. He was 88 years old. Mr. Wolf was born in Beaver County, Pennsylvania. His engineering work included direction of the Bureau of Public Works for the Philippines, with headquarters at Manila.

Harry B. Merriam, a retired civil engineer, died at Falmouth, Me., on Dec. 21 at the age of 83, after an illness of ten days. He was a graduate of the Massachusetts Institute of Technology and was formerly engaged in railroad construction in the middle west and Rocky Mountain states.

H. Kulka, professor of engineering at the Technical University of Hannover, Germany, died recently in Holland. He was well known in this country for his book, "Eisenwasserbau," which dealt with hydraulic engineering works of steel and included an exposition of the application of flow nets to hydraulic problems.

W. Roscoe Bonsal, civil engineer, former vice-president of the Seaboard Air Line Railway, died at his home in Lenox, Mass., December 20 after a short illness. He was born at Baltimore, Md., 65 years ago and was educated in engineering at Princeton University, graduating in 1898. For many years he made headquarters at Baltimore and at Charleston, S. C.

George Mann, builder, died at his home in Baltimore, Md., on Dec. 22 at the age of 83. A native of Scotland, Mr. Mann went to Baltimore at the age of 23 and entered the building business, establishing the firm of George Mann & Son. Included among the works of that firm were the spires of St. Patrick's Cathedral in New York City, portions of the Congressional Library at Washington, the Drexel Building in Philadelphia and the Baltimore Court House.

Philipp Forchheimer, prominent European hydraulic engineer, died recently in Vienna, at the age of 81. He had been professor of hydraulic and bridge engineering in Constantinople, in Aachen, Germany, and in Graz, Austria. In 1914 he went again to Constantinople to reorganize the technical education system. Dr. Forchheimer was the author of more than 50 publications, but was known particularly for his classic book "Hydraulics," the standard European reference book on this subject.

Robert Allen Pendergrass, resident vice-president of the McClintic-Marshall Corp., in New York City, died at his home in Hastings-On-Hudson, N. Y., on Dec. 21, at the age of 57. Mr. Pendergrass was born in Troy, N. Y., and was graduated from Cornell University in 1901. Excepting for a short time with the American Bridge Co., his business career was entirely with McClintic-Marshall Corp. He was in charge, during the World War of fabricated ship operation for the company for the Emergency Fleet Corporation. He later represented the company in the building of the George Washington Bridge across the Hudson River.

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CONSTRUCTION STATISTICS OF THE WEEK

Contract awards for the current week were affected by the holidays, the total falling off to $16,225,000, as compared with an average of over $27,000,000 for the previous four weeks. All classes of heavy construction were lower than for the previous month, with public works showing a greater loss than private construction from the average of the past month. Highway lettings in Missouri, aggregating $1,260,000, accounted for a fifth of the week's road contracts. A yeast plant in Oakland, Cal., $1,000,000, was the largest single contract of the week.

New capital figures for the week also were much lower than usual, totaling only $5,953,000. The PWA reported but one public and one private loan, totaling $554,000. In the accompanying new capital table, the total PWA figures have been corrected to correspond with the latest summary released by the administration. A reduction in several allotments and cancellation of a few loans reduced the total from that previously reported.

CONTRACTS
(Thousands of Dollars)

	Weekly Dec. 1932	Average Prev. 4 Weeks	Week Dec. 28, 1933
Federal Government	$6,095	$7,105	$2,498
State and municipal	10,024	13,302	8,268
Total public	$16,119	$20,407	$10,766
Total private	4,553	7,207	5,459
Week's total	$20,672	$27,614	$16,225

Cumulative to date:
1932 ...$1,219,309 1933....$1,068,566

NEW PRODUCTIVE CAPITAL
(Thousands of Dollars)

	Week Dec. 28, 1933	Cumulative 1933
State and municipal ...	$1,719	$277,034
PWA allotments, public	470	*813,673
Corporate issues	3,680	54,928
PWA allotments private	84	*237,322
Total new capital...	$5,953	*$1,382,957

Cumulative, 1932 ....$720,000

*Revised totals.

Note: These figures include private bonds and stock sold for productive purposes; state and municipal bonds for construction; R.F.C. advances for self-liquidating loans; PWA loans and grants to state and municipalities, including the special highway funds; and PWA private loans.

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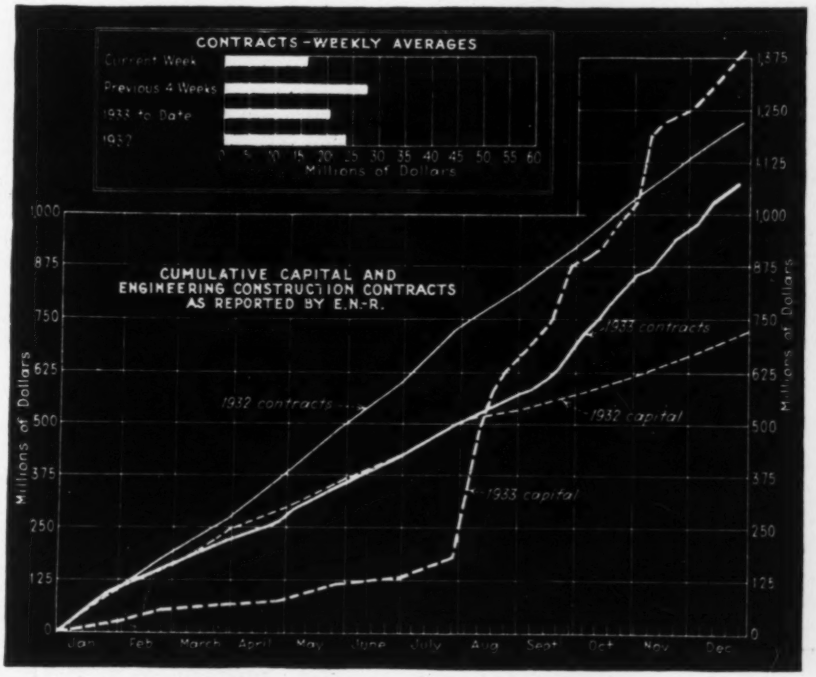
E.N.-R.-Cost		E.N.-R.-Volume	
December, 1933	**192.14**	**November, 1933**	**133**
November, 1933..	190.14	October, 1933.....	162
December, 1932..	158.46	November, 1932..	137
1932 (Average)..	156.97	1932 (Average)...	127
1931 (Average)...	181.35	1931 (Average)...	220
1930 (Average)..	202.35	1930 (Average) ..	260

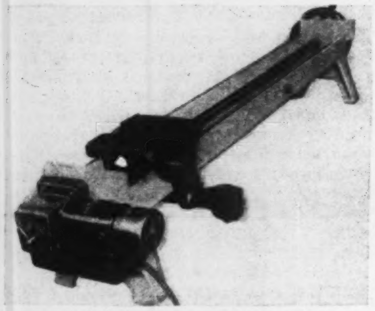
1913 (Average)............... 100



Construction Equipment and Materials

Automatic Gas Cutting Machine

A new cutting machine, known as the Oxweld straight-line cutting machine, has been added to the Oxweld line of welding and cutting apparatus by The Linde Air Products Company, of New York City. The machine consists essentially of a steel channel supporting base, a means for moving the blowpipe, and adjustments for setting the blowpipe to cut bevels. Movement in two directions is possible, 45 in. longitudinally and 7¾ in. laterally. The machine can be furnished either with two traverse hand wheels for hand operation, or with one hand wheel and an electric motor.



Oxweld straight-line cutting machine

The carriage is supported by a three-point suspension and an automatic catch disengages the carriage from the worm drive when the end of the track is reached. The working parts are completely protected from dirt by a metal cover. The machine has a linear speed range of up to 33 in. per min., depending on the gear ratio specified, and has a governor graduated in inches per minute for setting the speed. A reverse switch permits motion in either direction.

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Asphalt Bridge Plank With Non-Skid Surface

Johns-Manville non-skid asphalt bridge plank

A new asphalt bridge plank that provides a bridge surface with all of the advantages of smooth-surfaced plank plus the additional feature of improved traction when wet, has been developed by the Johns-Manville Co., New York. This asphalt bridge plank is a mixture of asphalt, fibre and finely divided mineral filler, into the surface of which coarse trap rock is embedded under hydraulic pressure. This surface is produced in such a manner as to permanently interlock the stone with the fibrous asphaltic body of the plank. The pressure under which this material is formed also increases its density and toughness. Each unit is accurate in dimension, which permits the securing of tight joints without the jacking or wedging which is usually required with normal asphaltic planks. Numerous tests have indicated that the traction offered by this mineral surface plank when wet is equal to that of concrete.

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New Equipment in Brief

Diesel generating set. The Buda Co., Harvey, Ill., announces the development of a light compact diesel generating set ranging in size from 10 to 90 kw., alternating and direct current. The manufacturer states that the engines do not require the services of an attendant, but only an occasional visit two or three times a day.

Alloy cast iron. The Robins Conveying Belt Co., New York, N. Y., has announced a new abrasion-resistant alloy cast iron, known as "Super Manga Iron." It is a nickel-chromium cast iron. A chilled surface will show a Brinell hardness of 600 to 750. The material may be sand cast to possess a solid white structure with Brinell hardness ranging from 475 to 625.

Flow Meters. Republic Flow Meter Co., Chicago, Ill., has redesigned its line of flow meters by introducing the "cartridge-sealed" principle into the actuating element. The cartridge-sealed element consists of the actuating unit built into a metal cartridge which forms a compact element for mounting on the instrument panel. The metal cartridges protect the element from dust, moisture and abuse.

Diesel tractor. The Cleveland Tractor Co., Cleveland, Ohio, announces a diesel crawler tractor in the 80-hp. class. The tractor will develop 85 hp. in second gear. Aside from the engine itself, the new tractor has the same specifications as the gasoline-powered Cletrac "80." The new machine weighs about 23,000 lb. and is 170 in. long by 94½ in. wide. It has a drawbar pull of 19,000 lb. at 1.7 miles per hour.

Needle valve. A newly designed line of high-pressure needles valves which have been made as small and compact as possible without sacrificing efficiency and quality has been placed on the market by Crane Company of Chicago, Ill. They are made from carbon steel or a high-chrome, stainless iron and the manufacturer states that they are suitable for all services in measuring pressures or volume of flow of fluids.

Trailer welder. Universal Power Corp., Cleveland, Ohio, announces the Universal arc welder, utilizing the shunt inductor principle, is now available with four-wheel portable trailer mounting. The Universal generator is flexibly coupled to a six-cylinder engine and mounted on a rigid structural-steel chassis, which is equipped with low-pressure balloon tires. An idling control permits the engine to run slowly when not loaded. When ready to weld, the operator at his electrode holder brings the equipment again to automatic governed speed.

Paintng machine. A motor-driven airless painting machine has been announced by the Electrical Painting Equipment Co., Inc., New York, N. Y. In the operation of the machine paint is thrown out by centrifugal force in an even fan-shaped spray which may be varied in width from less than 1 in. to 18 in. The cutoff on all four sides can be held sharp at the option of the operator, making it possible to paint up to door frames or base-boards without splattering. The machine weighs 5½ lb. Power is obtained from an ordinary lighting circuit.

Wedge Socket: A new "No Pinch" type of wedge socket has recently been placed on the market by the John A. Roebling Sons Co. of Trenton, N. J., designed to protect wire rope against abuse. The maker states that the No Pinch wedge socket may be depended upon to develop in excess of 90 per cent of the ultimate rope strength. The essential feature of the device is that the grooves of wedge and socket are machined to protect the rope against abrasion, and that the bearing surfaces of wedge and socket are machined to eliminate pinch from the live side of the rope.

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New Publications

Armored Concrete. **The Armored Concrete Corporation, Newark, New Jersey, give photographs of installations of their surface protection in a four-page leaflet.**

Filters. **Hungerford and Terry, Inc., Clayton, N. J., have just published bulletin No. 23 illustrating and describing their Air-Water-Wash Gravity Filter.**

Cement. **The Kosmos Cement Co., Kosmosdale, Ky., has recently issued a 16-page bulletin describing the advantages of their Kosmos super cement, listing its peculiar properties, with reference to a few of the jobs on which it has been used.**

Pumps. **The Chain Belt Company, Milwaukee, Wis., have recently issued a catalog describing their Rex Speed Prime Pumps, covering features, makes, advantages, and including 3 pages of well-arranged data from which to figure pump requirements.**

Wedge Sockets. **The John A. Roebling Sons Co., Trenton, N. J., have just issued a six-page booklet describing their new No Pinch wedge socket. A description of the device and its principle, methods of attachment, and a table of clearance dimensions are included.**

Belt Idlers. **The Jeffrey Manufacturing Co., Columbus, Ohio, have issued their Bulletin No. 569, presenting their line of Reliance belt idlers. A full description of the special features of these idlers is given together with specifications and tables of dimensions and prices in this 11 page catalog.**

Hardware. **The Thomas Laughlin Co., Portland, Maine, have issued a 109 page catalog showing their entire line of marine and industrial hardware. Cuts of the individual items, with price-lists for each and detailed descriptions where necessary are included, as well as an index of items and figure numbers.**

Cadmium Coated Trusses. **A bulletin announcing the "Rustless Economy Truss" has been published by C. A. P. Turner, Minneapolis, Minn. The truss is said to be of novel form and the rustproofing is effected by a cadmium coating 0.0004 in. in thickness. Three different methods of cadmium application are employed, one for bolts and nuts, another for large sections, both electrolytic, while the third is a hot spray method by which rivet heads are coated in the field and portions of the electrolytic coating renewed where burned off in welding. It is claimed that the coating can be applied at such cost that will make it economically desirable because of the elimination of painting expense.**

CONSTRUCTION REPORTS

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Federal Government projects are classified under heading denoting type of work and designated by symbol †

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WATERWORKS

PROPOSED WORK

Calif., Long Beach—City made application to P.W.A. for $77,340 grant toward cost of constructing six 132 ft. diam., steel storage tanks, 35 ft. high. Est. $266,340. A. H. Adams, City Hall, dir. P. Wks.

Colo., Montrose—City filed application for P.W.A. loan to finance construction filtration plant. $40,000. B. Lowther, Denver, engr.

Ga., Rome—City, constructing improvements to city's waterworks system, incl. filtration plant, storage facilities, pumping equipment, $230,000, and extension to sanitary sewerage system, $130,000, 30% is a grant and balance is a loan. Work scheduled to start in a month or 6 weeks and be completed in 8 months.

Ill., Anna—City, C. F. Watson, clk., soon takes bids two 250 g.p.m. pumps, and motors, deep well, 2,000 ft. 8 in. c.i. mains, 100,000 gal. tank on tower, water softener. $75,000. Warren & Van Praag, Inc., Milliken Bldg., Decatur, engrs.

Ill., Knoxville—Town plans waterworks improvements, repairing pump house, reconstructing present well and constructing new deep well. $25,000. **Maturity probably in February.** H Butt, Knoxville, engr.

Ill., Peoria Heights—Village, plans waterworks and distribution system, 2 well rein.-con. reservoir, 1 story, brick, pump house, two 550 g.p.m. turbines, 450 ft. lead. 120 hp. 3 ph. a.c. motors. $85,000. W. P. Backes, Peoria, engr. Noted July 21.

Ill., St. Elmo — City plans waterworks and distribution system, incl. pump house, reservoir, elevated tank, tower, c.i. pipe, distribution system. $65,600. Will hold bond election and apply for P.W.A. loan. Beard Eng. Co., Clayton, engrs.

Ill., Springfield—City plans water treating plant. $1,000,000. Will ask loan under P.W.A. Burns & McDonnell Eng. Co., 107 Lindwood Blvd., Kansas City, Mo., engrs.

La., Duson—City, made application for P.W.A. loan of $24,000 to finance construction waterworks system. J. B. McCrary, 22 Marietta St., Atlanta, Ga., engrs. R. Lagneaux, mayor.

Mass., Tewksbury—Commonwealth of Massachusetts, Dpt. P. Welfare, State House, Boston, making plans additional water supply at State Infirmary. H. Goodnouth, Inc., 11 Beacon St., Boston, engrs.

Minn., Ely—City defeated $60,000, municipal water and light plant improvements. Noted May 11.

Minn., New York Mills—Village plans waterworks system. $22,000. A. A. Hawkinson, New York Mills, engr.

Miss., Laurel — City plans aplication for P.W.A. loan of $250,000-$300,000 to finance waterworks improvements. H. A. Mentz, Hammond, La., engr. Noted Aug. 24.

Mo., Miller—City, C. C. Sherman, mayor, plans waterworks system. $35,000. Applied for loan and grant under P.W.A. Ozark Eng. Co., Springfield, engrs.

Mo., Grandview—City plans waters system, incl. mains, submains, storage tank. $190,000. Loan and grant approved by State. C. A. Haskins & Co., 517 Finance Bldg., Kansas City, engrs.

Mo., Licking—City plans waterworks and distribution system, power and light system. $72,858. Applied for $20,524 grant and $52,534 loan under P.W.A. A. H. Beard, 44 South Central Ave., Clayton, engr. Noted Dec. 7.

Mo., Oak Grove—City, B. W. Calvin, mayor, plans waterworks system. $40,000. Applied for $10,000 grant and $31,000 loan under P.W.A. Shockley Eng. Co., 800 Graphic Arts Bldg., Kansas City, engrs.

Mo., Purdy—City, J. G. Grain, mayor, plans waterworks system. $43,057. Applied for $12,900 grant and $22,500 loan under P.W.A. C. C. Gillan, city engr.

Mo., Trenton—City plans waterworks improvements, incl. 500,000 gal. steel tank on tower, etc., $32,220. Applied for $8,470 grant and $23,750 loan under P.W.A. W. E. Ralls, city engr. Burns & McDonnell Eng. Co., 107 West Linwood Blvd., Kansas City, engrs. Noted Mar. 17, 1932.

N. Y., Holland—Town plans installing new pumping equipment, aerators, chlorinator, 200,000 gal. steel reservoir, installing complete distribution system. $81,000. Loan and grant allotted by P.W.A.

N. Y., Washington Mills—City plans water project, incl. 9,000 lin.ft. pipe, to connect with Consolidated Water Company's mains. $25,000.

N. C., Blowing Rock—Town filed application for Federal loan—P.W.A. to finance water and sewer improvements. $25,000. G. C. Robbins, mayor.

N. C., Lexington—City filed application to P.W.A. for loan to finance enlargement of city's water plant. $100,000. B. V. Hedrick, mayor. N. R. Kinney, city engr.

N. C., Pittsboro—Town seeking loan from P.W.A. to finance water and sewer improvements. $40,000. F. L. Paschal, mayor.

N. C., Thomasville—Town seeking loan from P.W.A. to construct extension to waterworks. $75,000. R. M. Cooksay, city mgr.

Okla., Ardmore—City plans water filtration plant. $36,000. Applied for loan under P.W.A. S. Mathews, Ardmore, engr.

Okla., Boley—City plans waterworks extensions. $38,500. Applied for loan under P.W.A. S. Embree, Holdenville, engr.

Okla., Hinton—City plans watermain extensions. $20,000. Applied for loan under P.W.A. J. Wilson, Hinton, engr.

Okla., Jet — City grants inew waterworks. $20,000. Applied for loan under P.W.A. V.V. Long & Co., Colcord Bldg., Oklahoma City, engrs.

Okla., Luther — City plans waterworks. $35,000. Applied for loan under P.W.A. V. V. Long & Co., Colcord Bldg., Oklahoma City, engrs.

Okla., Salina—City plans waterworks. $18,190. Applied for loan under P.W.A. V. V. Long & Co., Colcord Bldg., Oklahoma City, engr.

Okla., Seiling — City plans waterworks $28,000. Applied to P.W.A. for loan. M. L. Cunningham, 1100 North 29th St., Oklahoma City, engr.

Okla., Stigler—City plans waterworks extensions. $15,000. V. V. Long & Co., Colcord Bldg., Oklahoma City, engrs.

Okla., Valliant—City plans waterworks system. $23,500. Applied for loan under P.W.A. V. V. Long & Co., Colcord Bldg., Oklahoma City, engrs.

Tenn., Jamestown—City plans installing complete waterworks system. $18,000.

Tex., Avery—City, c/o W. M. Bryan, mayor, filed application with P.W.A. for loan to finance construction waterworks. $50,550. D. C. Walmsley, Thomas Bldg., Dallas, engrs.

Tex., Cleburne—City, c/o J. L. Lain, filed application with P.W.A. for loan to finance construction waterworks improvements. $35,000. Wiley G. Clarkson & Co., 1st Natl. Bank Bldg., Fort Worth, engrs.

Tex., Glen Rose—City plans waterworks and sewerage systems. $64,000 loan and grant approved by P.W.A. J. Rady, Provident Bldg., Waco, engr. Noted July 13.

Tex., Lindale—City, c/o M. H. York, mayor, plans waterworks and sewers. $56,525. Montgomery & Ward, Harvey-Snyder Bldg., Wichita Falls, engrs. Noted Mar. 2.

Wis., Stoughton — City rejected bids filter plant. Work postponed indefinitely. Noted Nov. 23.

Ont., Burlington—Water Comrs., A. M. Wilson, secy., will shortly consider report from G. H. Power, engr., Watson St., Oakville, regarding construction intake pipe, sedimentation basin, pumphouse and 12 in. c.i. main. $85,000.

Ont., Paris—Council will consider installation of booster pump construction of another deep well, 6 and 8 in. water-mains. $25,000. F. B. Goedike, 578 Indian Rd., Toronto, engr.

BIDS ASKED

Ill., Auburn—Jan. 6, by City waterworks system, incl. force main to connect with trunk line from Springfield, pumping station, pumps, motors, tank on tower, local distribution mains, fire hydrants. $299,000 loan and grant allotted by P.W.A. Caldwell Eng. Co., Jacksonville, engrs.

Ill., Chatham—Jan. 6, by City, waterworks system, incl. force main to connect with trunk line from Springfield, incl. local distribution mains, pumping plant, equipment, tank, etc. $63,000 allotted by P.W.A. Caldwell Eng. Co., Jacksonville, engr.

Ill., Cobden—Jan. 4, by L. Sumner, city clk., 124,000 gal. rein.-con. reservoir; 20,000 gal. concrete reservoir, pump house, complete with deep well and high service pumps, deep well, 32,130 lin.ft. 2- to 8½-in. c.i. mains. $70,000. Loan and grant allotted by P.W.A. Russell & Axon, 4903 Delmar Blvd., St. Louis, engrs. Noted Dec. 5.

Ill., Divernon—Jan. 6, by City, waterworks and distribution system, incl. pumping equipment, tank on tower, force main, trunk line from Springfield, and local system of distribution mains, hydrants, valves, and boxes, etc. $63,000. P.W.A. project. Caldwell Eng. Co., Jacksonville, engrs. Noted Dec. 14.

Ill., Girard—Jan. 6, by City, 8 in. force main from Virden, Ill., and 6 in. lateral mains, fire hydrants, valves and boxes in city. $90,000. Caldwell Eng. Co., Jacksonville, engr. Noted Dec. 14.

Ill., Pawnee—Jan. 6, by City, waterworks system, incl. force main, trunk line from Springfield pumping station and equipment, tank on tower, local distribution system, fire hydrants. $74,000 allotted by P.W.A. Caldwell Eng. Co., Jacksonville, engrs.

Ill., Virden—Jan. 6, by City Clerk, waterworks system, incl. force main, to connect with trunk line from Springfield pumping station, pumps, motors, tank on tower, distribution lines, fire hydrants, valves and boxes. **P.W.A.** allotted $188,000. Caldwell Eng. Co., Jacksonville, engrs. Noted Dec. 14.

CONTRACTS AWARDED

†Calif., San Diego — Yards & Docks, Navy Dpt., Wash., D. C., 4,050 ft. c.i. waterpipe, 11 fire hydrants, valves, storm drain, septic tank, piping, extending electrical work, Spec. 7556, to M. H. Golden, Calif. Bank Bldg., San Diego, $9,096. Bids Dec. 5, awarded Dec. 7.

Calif., Santa Cruz—City Clerk, furnishing 15,444 lin.ft. 14 in. and 5,690 ft. 10 in. Class 150, c.i. waterpipe to U.S.C.I. Pipe Co., Monadnock Bldg., San Francisco, $38,868; erecting two 1 m.g.d. steel water tanks to be 108 ft. 4 in. diameter and 16½ ft. high to Pittsburgh-Des Moines Steel Co., Rialto Bldg., San Francisco, $25,310. Bids Dec. 9, awarded Dec. 12.

D. C., Wash.—U. S. Eng., 1068 Navy Bldg., Wash., D. C., furnishing, installing control equipment Booster Pumping Station, Dalecarlia Reservoir, to Roller-Smith Co., Bethlehem, Pa., $26,522. Noted Sept. 7.

Minn., Mound—Village, 30,000 lin.ft. 6 and 8 in. c.i. pipe, hydrants to E. Preston, 609 New York Ave., N., St. Paul, and to Shea-Adamson Co., 683 Snelling Ave., N., St. Paul, $46,031.

†Federal Government.

SEWERAGE AND WASTE DISPOSAL

PROPOSED WORK

Conn., Norwich—City made application to State P.W.A. Bd. for federal aid to finance construction disposal plant. $150,000. Chandler & Palmer, Thayer Bldg., Norwich, engrs. Noted Oct. 1, 1931.

Ga., Rome—See "Waterworks."

Ill., Abington—City plans sewage disposal plant. $50,000. Applied for loan under P.W.A. Wells Eng. Co., Geneva, engrs.

Ill., Belleville—City election Apr. 3, to vote on proposal to construct sewage disposal plant. $300,000. C. A. Heinzelman, city engr.

Ill., Breese — City plans sanitary sewerage system. $93,000. Applied for loan and grant under P.W.A. Kinsey Eng. Co., Pekin, engrs.

Ill., Girard—City plans sewer system. $60,000. Will apply for loan and grant under P.W.A. Caldwell Eng. Co., Jacksonville, engr.

Ill., St. Charles — City making plans and soon takes bids sewage disposal plant, pump house, activated sludge system. $115,000. Wells Eng. Co., Geneva, engrs. Applied for loan under P.W.A.

Minn., Lakeville — Village voted $25,000 bonds, sanitary sewerage system and sewage disposal plant. Druar & Milinowski, 904 Globe Bldg., St. Paul, engrs.

Minn., Moorhead—Voted $150,000 bonds sewage disposal plant. Seeking Federal aid. Buell & Winter Eng. Co., 503 Insurance Bldg., Sioux City, Ia., engrs.

Mo., Higginsville — City plans improving sewers. To exceed $25,000. Applied for loan and grant under P.W.A. M. Layne, city engr.

Mo., Houston—City surveys sewers. To exceed $25,000. Loan and grant approved by State. C. A. Haskins & Co., 527 Finance Bldg., Kansas City, engrs.

Mo., Oak Grove—City, B. W. Calvin, mayor, plans sanitary sewerage system, etc. $43,183. Applied for $9,483 grant and $33,700 loan under P.W.A. Shockley Eng. Co., 800 Graphic Arts Bldg., Kansas City, engrs.

Mo., Pilot Grove—City, W. A. Scott, mayor, plans sanitary sewerage system. Applied for $4,200 grant and $18,000 loan under P.W.A. W. B. Rollins & Co., 339 Railway Exch. Bldg., Kansas City, engrs.

Mo., Springfield—Voted $735,000, for sewers. Grant and loan approved by P.W.A. Russell & Axon, 4903 Delmar Blvd., St. Louis, engrs.

N. C., Blowing Rock—See "Waterworks."

N. C., Pittsboro—See "Waterworks."

N. C., Salisbury—Town seeking loan from P.W.A. to finance construction sewage disposal plant, also installing 12 mi. pipes. $400,000. H. W. Davis, mayor.

Okla., Ardmore—City plans sewage disposal plant. $39,300. Applied for loan under P.W.A. S. Mathews, Ardmore, engr.

Okla., Boley—City plans sanitary sewerage system. $68,660. Applied for P.W.A. loan. S. Embree, Holdenville, engr.

Okla., Pawnee—City defeated $30,000 bonds, for sewage disposal plant. J. A. McDaniel, Pawnee, engr. Noted Dec. 7.

Tex., Corpus Christi—See "Bridges and Grade Crossings."

Tex., Fort Worth—City, c/o G. D. Faitrace, mgr., filed application with P.W.A. to finance construction sewage disposal plant. $519,000. D. L. Lewis, engr.

Tex., Glen Rose—See "Waterworks."

BIDS ASKED

Mass., Quincy—See "Contracts Awarded."

Minn., Montevideo—Jan. 2, by City, sewage disposal plant. $60,000. M. E. Chamberlain, city engr. Noted Sept. 27.

N. Y., Central Islip—Jan. 24, by Commissioner Dpt. Mental Hygiene, State Office Bldg., Albany, sewage disposal plant at Central Islip Hospital.

N. Y., Wingdale—Jan. 10, by Dpt. Mental Hygiene, State Office Bldg., Albany, sewage disposal plant, incl. furnishing and installing pipe railing around primary and final settling tanks at Harlem Valley State Hospital.

Tex., Hyland Park—See "Contracts Awarded."

Tex., University City—See "Contracts Awarded."

Ont., Kirkland Lake — See "Contracts Awarded."

CONTRACTS AWARDED

Mass., Quincy—City storm and sanitary sewer construction and drainage facility extensions, storm sewer construction and diversion of Brook drains, $36,600 grant and balance of total cost $159,000, 4% loan, sanitary sewers $339,000 total cost, grant $77,400 balance 4% loan, sanitary sewers Houghs Neck, Squantum and Adams Shore, owner builds with unemployed labor. Total cost $498,000. A. P. Bizzozero, P. Wks. Dpt., in charge. **P.W.A.**

Minn., Sauk Center—City sewage disposal plant to M. J. O'Neil, 619 New York Bldg., St. Paul, $54,000.

Neb., Columbus—City, sewers in Dists. 1, 2, 3 and 4 to Dussell & Son, Columbus, $62,375.

†O., Fairfield—Con. Q.M., Patterson Field, constructing paving, sidewalks, culverts, storm sewers, gas distribution system, to J. R. Hiatt Co., Indianapolis, Ind., $150,705. Bids Dec. 8. Noted Nov. 28 Daily.

S. D., Mitchell—City, sewer pipe to Dakota Concrete Products Co., Mitchell, $35,297*** storm sewer revision to F. Bjodstrup, Mitchell, $21,941.

Tex., Hyland Park—City, sewerage system, day labor. $74,000. Work started Dec. 15.

Tex., University—City, sewerage system, day labor. Work started Dec. 15. $75,000. W. G. Cullum, Central Bank Bldg., Dallas, engr.

Ont., Kirkland Lake—Town, constructing sewers, day labor. Est. $135,000. Pipe will be purchased by C. Brown, supt. Kirkland Lake. Noted Nov. 23.

BRIDGES AND GRADE CROSSINGS

PROPOSED WORK

Calif., Burbank—City and Los Angeles Co. (Los Angeles) preparing plans 4 span 314 ft. rein.-con. bridge over Los Angeles River, Olive Ave. Supervs. Los Angeles Co. appropriated $40,000 for work. H. I. Stites, city engr. W. D. Armstrong, Hall of Records Bldg., Los Angeles, engr.

Mass., Newton—City, S. Weeks, mayor, City Hall, preliminary plans concrete, steel bridge over Charles River. To exceed $25,000. Wm. P. Morse, city engr.

Minn., Jordan—Scott Co., T. H. Walsh, aud., Shakopee, and Carver Co., W. Schimmelpfenig, aud., Chaska, plan rein.-con. bridge over Minnesota River, near here. $65,000. Counties contributed $25,000 toward project. Scott Co. applied for loan under P.W.A.

Okla., Tulsa—City plans repairing and new walks for 11th Street Bridge. $195,000. Applied for loan under P.W.A. M. C. Shibley, city engr.

R. I., Westerly—Town, Hy. Dpt., Town Hall, completing plans and soon takes bids concrete, steel highway bridge. $50,000. H. Congdon, Town Hall, engr.

Texas—State Hy. Comn., J. Wood, chn., Austin, plans underpass and roadway approaches, Hys. 1 and 37, N.R.H.-M. 18, Franklin Co.; steel, concrete bridge, approaches over Onion Creek, Hy. 71, N.R.H. 302-A, Travis Co. P.W.A. project.

Tex., Corpus Christi—City, c/o Mayor, filed application with P.W.A. to finance construction draw bridge, sewer improvement and bay front improvements. $2,470,600. L. B. Griffith, Corpus Christi, engr.

B. C., Vancouver—Citizens have voted to give franchise to build 1,500 ft. suspension bridge and approaches, over 1st Narrows, incl. road through Stanley Park, etc., to 1st Narrows Bridge Co., 675 West Hastings St. Est. $6,000,000. Plans have yet to be approved by Dpt. of Marine at Ottawa, Ont. Montserratt & Pratley, Drummond Bldg., Montreal, Que., engrs.

Ont., Bridgeport—Waterloo Co. making plans 420 ft. rein.-con. bridge, 34 ft. wide, to replace present bridge. $70,000. Work will probably be done by day labor as unemployment relief under supervision D. N. Empey, County Buildings, Kitchener, co. engr.

BIDS ASKED

California—Jan. 3, by State Dpt. P. Wks., 500 Sansome St., San Francisco (not State Hy. Comn., Sacramento, as previously reported), 22 rein.-con. piers, etc., for upper deck hy. in Oakland, immediately east of East Bay Crossing of San Francisco-Oakland Bay Bridge, Alameda Co. This corrects report published in Dec. 19 Daily and Dec. 21 E. N.-R.

Massachusetts—Jan. 2, by Commonwealth Massachusetts, Dpt. P. Wks., 100 Nashua Boston, F. E. Lyman, A. W. Dean, ch. en Project N.R.M. 170-C, substructure for bri over Fore River, between Quincy and Weymou consisting of 2 concrete abutments and 9 c crete piers, faced with granite, also filling a grading for approaches and miscellaneous tow work. Superstructure will be of structu steel, for which bids will be called later. To est. $2,500,000. Noted Aug. 24.

†Massachusetts—Jan. 3, by U. S. Eng., C tom House, Boston, constructing superstructu 2 highway bridges over Cape Cod Canal. Not Dec. 21.

Mass., Auburn—Jan. 2, by Commonwealth o Massachusetts, Dpt. P. Wks., 100 Nashua S Boston, N.R.M. Project 130-A, constructing 1 ft. span, steel through plate girder bridge wi concrete abutments, over New York, New Hav & Hartford R.R., also widening present 22 f span rein.-con. beam bridge. To exceed $35,00 F. E. Lyman, 100 Nashua St., Boston, com A. W. Dean, ch. engr.

New Jersey—Jan. 2, by State Hy. Com Trenton, bridge to carry Route 6, Sect. 1- across Route 2, North, Hasbrouck Height Bergen Co. L. A. Grover, ch. clk.

New York—Jan. 6, by Triborough Brid Authority, 141 Bway., New York, pier founda tions, etc., for Randalls Island and Little H Gate of Triborough Bridge, connecting Man hattan, Bronx and Queens Boroughs. Not Nov. 30 under "Contracts Awarded."

CONTRACTS AWARDED

California — State Hy. Comn., Sacrament constructing steel stringer bridge with concre decks, consisting of one 50 ft. one 44 ft. an two 32 ft. spans on concrete piers and abu ments, etc., across Yellow Creek, 2 mi. west o Howell, Plumas Co., to E. T. Lesure, 87 Ro Circle, Oakland, $18,462 (second low bidde bid of low bidder declared illegal due to fa that certified check of 10% was insufficient) constructing steel stringer bridge with concre deck over Santa Ana River, Orange Co., to F. B Gridley, 256 South Lake Ave., Pasadena, $41 832. Bids Dec. 6. Noted Nov. 30.

Illinois—State Dpt. P. Wks. & Buildings, Di Hys., Springfield, bridges in Jackson Co., to Casey Constr. Co., Casey, $17,411***Ford an Champaign Counties, to Zimmerly Bridge Co Paris, $55,911***Franklin and St. Clair Coun ties, to Vincennes Bridge Co., Vincennes, Ind $10,335 and $19,456 respectively***Ogle Co to Shapport Eng. Co., Belvidere, $164,019*** Cumberland Co., to M. C. Robinson, Girard $12,437. Grand total $279,569. Bids Dec. 1 awarded Dec. 16. Noted Dec. 7.

Minn., Rochester—City, 2 rein.-con. bridge to C. C. Pagenhart, 20½ Southwest 2nd St Rochester, $22,970 and $12,987 respectively **P.W.A.**

Missouri—State Hy. Comn., Jefferson City bridges over Greer Creek and over branch Osage Fork, Webster Co., to H. H. Ruddell, Springfield***bridge over branch Sta. 72-72, over branch Sta. 318-46, and over branch Sta. 3314-40, all Jackson Co., to Kelly & Underwood, Granby***over McGills Creek, Caroll Co. and over railroad, Sullivan Co., to A. Melberg, Cedar Rapids, Ia.***over Boline Creek and over Sand Stone Creek, Miller Co., to E. K. Porter, Carrollton***over Skull Lick Creek, over Little Skull Lick Creek, and over Fish Branch, all Audrain Co., to Campbell, Schultz & Co. and H. C. Grunwald, Troy***over creek, Franklin Co., over Town Creek, Polk Co., to F. T. O'Dell & Lay Constr. Co., Hannibal***over Norris Branch, over east fork Little Honey Creek, and over east branch Little Honey Creek, all Henry Co., to Hoover Bros. Constr. Co., 2716 McGee St., Kansas City***over Davis Creek Drainage Ditch, over Crow Creek, over old channel Davis Creek, all Lafayette Co., to Lay Constr. Co. & Henderson Constr. Co., North Kansas City***over Bee Branch, Black Water River, over Bear Creek, and over south fork Black Water River, all Pettis Co., to C. I. Williams, Monett***over branch, Oregon Co., to Carte Harlin Constr. Co., West Plains***over Little St. Francois River, St. Francois Co., to Knox & Penzel, Jackson***over branch, Greene Co., to Neyer Constr. Co., Billings***over branch, Stone Co., to M. E. Gilloiz, Monett***over Prairie Creek, Henry Co., to A. E. Walesby, Jr., Independence. Bids Dec 8. **P.W.A.**

Montana—State Hy. Comn., Helena, bridges in Cascade Co., to F. B. Dudley, Great Falls, $16,964***bridge over Wolf Creek, Judith Basin Co., to W. P. Roscoe, Billings, $2,243***bridges in Phillips Co. and Wheatland Co., to L. V. Lockwood, Glasgow, $4,446 and $17,990. Grand total $41,542. Withdrew bids to have been opened Dec. 15, bridge in Lake Co. Bids Dec 15. Noted Dec. 7.

N. Y., Aurora—Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad Street Sta., Phila. Pa., eliminating Wilson Rd. Crossing, in Aurora

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†Federal Government

Bridges, etc. (Continued)
and of various streets in village of East Aurora together with extension of Girard Ave. across railroad in East Aurora, to Ferguson & Edmondson Co., Keystone Bldg., Pittsburgh, Pa., $437,412. Est. $702,000. Noted Aug. 3.

Tenn., McMinnville—Warren Co., bridge, to J. D. Ham & Sons, Gallatin, $23,636. Est. $16,000.

STREETS AND ROADS

BIDS ASKED

Calif., San Rafael—S. J. Hester, secy. Dpt. P. Wks., City Hall, cancelled bids to have been opened Dec. 15, 2 in. asphaltic concrete surfacing, incl. prepare subgrade 98,000 sq.ft. and 2 in. asphalt concrete surfacing and 6 in. rein.-con. 46,000 sq.ft. Golden Gate Park Rds., Contr. No. 3. $23,000. Will readvertise.

Ill., Danville—Jan. 4, by Vermilion Co., concrete paving 2.018 mi. Sect. 230M.F.T. G. H. Baker, engr. co. roads and city streets.

Kentucky — State Hy. Comn., Frankfort, rescinded contract slag surfacing 10.225 mi. Inez-Paintsville Rd., N.R.H. 139-BS, Martin Co. Will readvertise. Former bids Oct. 20. Noted Nov. 2, under "Contracts Awarded."

Kentucky — Jan. 5, by State Hy. Comn., Frankfort, grading, draining 2.463 mi. Lawrenceburg-Bardstown Rd., N.R.H. 185BG, Anderson Co.; 1.697 mi. Cave City-Hiseville-Sulphur Well Rd., N.R.S. 250BG, Barren Co.; 4.011 mi. Louisville-Shelbyville Rd., N.R.H. 117 CG, Jefferson Co.; 1.875 mi. Brodhead-Eubank Rd., N.R.S. 313 AG, Rockcastle Co.; 2.006 mi. Monticello-Bethseda Rd., N.R.S. 315 AG, Wayne Co.; 1.225 mi. Blackey-Ulvah Rd., FR 36 CG, Letcher Co.; 7.75 mi. Booneville-Manchester Rd., Owsley Co.; low type surfacing 5.347 mi. Jackson-Salyersville Rd., N.R.S. 266 A.S., Breathitt Co.; 5.899 mi. Grant's Lick Peach Grove Rd. N.R.S. 262 AS, Campbell and Pendleton Counties; 10.225 mi. Inez-Paintsville Rd., N.R.H. 139 BS, Martin Co.; 12.152 mi. Owingsville-Frenchburg Rd., S.P. 61, BS, Bath Co.; high type surfacing 2.891 mi. Allen-Lackey Rd., N.R.H.M. 237 FF1-S, Floyd Co.; 3.056 mi. Paducah-Smithland Rd., N.R.M. 58 BS, N.R.H. 58AS, McCracken Co.; medium type surfacing 17.27 mi. Harlan-Whitesburg Rd., N.R.H. 140 BS, Harlan Co.

Miss., Hattiesburg—Bd. Supervs. Forrest Co. rejected bids Dec. 4, paving 3½ mi. roads.

†Montana — Jan. 11, by P. Rds., Portland, Ore., grading 4.15 mi. Transmountain Hy., Helena Natl. Park.

New Hampshire—State Hy. Dpt., Concord, rejected bids Dec. 1, 3 in. bituminous macadam on 4 in. broken stone base course paving 0.488 mi. Dartmouth College Rd., 24 to 49 ft., Grafton Co. $23,000.

N. Y., New York—Jan. 4, by S. Levy, pres. Manhattan Boro, Municipal Bldg., grading, regulating, curbing, sidewalks on 12th and 13th Aves. from 27th to 30th Sts.; 29th St., from 11th to 13th Aves.; granite block repaving Marginal St., 13th to 12th Aves.; sheet asphalt on concrete repaving 29th St. from 11th to 13th Aves.

Utah—Jan. 4, by State Rd. Comn., Salt Lake City, grading, drainage, crushed graveling 7.623 mi. road between LaVerkin Junction and Dalton Wash, Washington Co.; 13.96 mi. road between Beaver and Minersville, Beaver Co. M. S. Kerr, state hy. engr.

Virginia—Jan. 4 (extended date), by State Hy. Comn., Richmond, improving roads in Franklin, Radford and Loudon Counties. A. H. Pettigrew, asst. engr. Noted Dec. 21.

Wash., Port Orchard—Comrs. Kitsap Co. bids about Jan. 14, constructing roads and surfacing 1 mi. Port Orchard-Long Lake Rd., and Wycoff and Suquamish Rds. $22,000. J. L. Berry, Port Orchard, engr.

CONTRACTS AWARDED

†Arizona—Pub. Rds., Phoenix, grading, draining, 5.322 mi. road Apache and Navajo Counties, to Everly & Allison, Albuquerque, N. M., $46,683. Est. $60,709. Bids Dec. 1. **P.W.A.**

†Arizona—Pub. Rds., Phoenix, grading, draining 6.849 mi. Sect. K, Springerville-Alpine-State Line Natl. Forest Rd., Apache Natl. Forest, Apache Co., to O. F. Fisher, Phoenix, $69,487. Est. $97,876. Bids Dec. 15, awarded Dec. 16. **P.W.A.**

Arizona—State Hy. Comn., Phoenix, reconstructing 23.6 mi. roads in Mohave Co., to Strong & Grant, and O. A. Thorne, Springville, Utah, $187,497. **P.W.A.**

California — State Hy. Comn., Sacramento, C. H. Purcell, engr., P. Wks. Bldg., grading, bituminous treated selected material surfacing 5.8 mi. hy. between Daugherty's Corner and Birchim Canyon, Inyo Co., to Basich Bros., 20,550 Normandie Ave., Torrance, $128,963***grading, fuel oil treating and applying bituminous surface treating 15.1 mi. hy. between westerly boundary and Camp Cajon, San Bernardino Co., to Sharp & Fellows Contg. Co., 533 Central Bldg., Los Angeles, $146,975. Bids Dec. 6, awarded Dec. 13. Noted Nov. 30.

†California—Pub. Rds., 461 Market St., San Francisco, bituminous treated crushed rock paving 91.287 mi. road Tulare Co., to Hemstreet & Bell, 501 11th St., Marysville, $89,914. Est. $129,929. Bids Dec. 12, awarded Dec. 13.

Colorado—State Hy. Dpt., Denver, gravel surfacing 3.448 mi. hy. between Greeley and Loveland on State Hy. 16, N.R.H. 186-B, Weld and bituminous concrete paving hy. Comb. Federal Aid Project and N.R.M. 296-G and N.R.M. 272-I, Pueblo Co., to Driscoll Constr. Co., $31,599 and $95,568 respectively***railroad crossing with paved approaches, Loveland, State Hy. 16, F.A.P. N.R.H. 186-B, Weld Co., to M. E. Carlson, 4483 Newton St., Denver, $45,609. Grand total $172,776. Bids Dec. 1, awarded Dec. 13.

Colorado—State Hy. Dpt., Denver, gravel surfacing 2,865 mi. hy. between Meeher and Craig on State Hy. 13, U.S.P.W. Project N.R.H. 211-D, Rio Blanco Co., to J. H. and N. M. Monaghan, 357 South Downing St, Denver, $54,086. **P.W.A.**

Connecticut—State Hy. Comn., J. A. Macdonald, state hy. comr., Hartford, bituminous macadam on trap rock paving 22,008 ft. Lebanon, to A. I. Sabin Constr. Co., 1179 Main St., Hartford, $149,388. **P.W.A.** Bids Nov. 27, awarded Dec. 15. Noted Nov. 23.

Illinois—State Dpt. P. Wks. & Buildings, Div. Highways, Springfield, concrete paving 1.26 mi. Will Co., to C. O'Brien & Son, Morris, $69,616***0.34 mi. Whiteside Co., to H. J. Eppel, Kewanee, $20,780***3.84 mi. Brown Co., P. Simons Sons, Quincy, $28,087***1.44 mi. Hamilton Co., to J. R. Cruse, Fairfield, $7,553***3.9 mi. Knox Co. and 2.01 mi. Pulaski Co., to O'Connor Constr. Co., Springfield, $38,405 and $9,717 respectively***5.33 mi. Lawrence Co. and 4.11 mi. Richland Co., to Waukegan Constr. Co., Mundelein, $43,136 and $37,043 respectively***2.01 mi. Marshall Co. to R. A. Cullinan, Tremont, $9,993***4.92 mi. Union Co., to W. H. Laird, Ewing, $46,403. Grand total $310,733. Bids Dec. 13 awarded Dec. 16. Noted Dec. 7.

Kansas — State Hy. Comn., Fort Scott, to Banta Constr. Co., Harper, earthwork, culverts, curbing, guttering 0.341 mi. Project 160-20-N.R.M. 451 B2, Barber Co., $8,054***to J. A. Tobin, Douglas and Woodland Sts., and Dan Scherrer Constr. Co., Barker Bldg., Kansas City, bituminous brick paving Project 73-13-N.R.H. 5A, Bourbon Co., $65,778; Bridge 1, Project 73E-13-N.R.H. 5A, Bourbon Co., $2,404***to Thogmartin-Reis Constr. Co., Fort Scott, rock asphalt surfacing 0.529 mi. Project 73E-12B-NRM 208 D, Bourbon Co., $18,288***to Maxwell Constr. Co., Columbus, concrete paving 0.318 mi. Project 73E-5-NRM 73 E, Cherokee Co., $18,182***to Independent Constr. Co., Pittsburg, Project 73E-8-NRM 40J, Crawford Co., $14,038; bituminous filled brick paving 0.303 mi. Project 73E-9-NRM 40 J1, Crawford Co., $5,265; 0.463 mi. Project 73E-9-NRH 40 J2, Crawford Co., $7,970***to Yancey Constr. Co., Abilene, earthwork, culverts 4.844 mi. Project 18-14-NRS 481C, Dickinson Co., $30,324; Bridge 1, Project 18-14-N.R.S. 481C, Dickinson Co., $2,353; concrete paving 0.354 mi. Project 50S-16-NRM 302 F, Stafford Co., $21,627; 0.577 mi. Project 96-3-NRM 387-B, Wichita Co., $19,225***to E. H. Hardman, Alton, 0.259 mi. Project 27-9-NRM 364 B, Greeley Co., $18,373***to Yant Constr. Co., 1146 Omaha Natl. Bank Bldg., Omaha, Neb., bit. mat. surfacing 1.701 mi. Project 59-1-NRS 491A, Harvey Co., $5,845***to M. W. Watson, Natl. Bank of Topeka Bldg., Topeka, concrete paving 0.518 mi. Project 50-4-NRM 338 E, Kearny Co., $25,809***to A. V. Eulich, 5436 Charlotte St., Kansas City, Mo., 0.114 mi. Project 54-21-NRM 341-I-1, Kingman Co., $8,466***to Dan Scherrer Constr. Co. and George Bennett Constr. Co., Barker Bldg., Kansas City, and Reece Constr., Scandia, earthwork and culverts on hy. Project 14-18-NRH 467 B, Lincoln Co., $36,826***to Eldorado Constr. Co., Eldorado, Bridge 1, Project 14-18-N.R.H. 467-B, $11,265; Bridge 2, Project 14-18-N.R.H. 467 B, $4,146; Bridge 3, Project 14-18-NRH 467B, $2,308, all Lincoln Co.***to San Ore Constr. Co., McPherson, concrete paving 0.212 mi. Project 81-12-NRM 287-D, $21,386***to A. G. Sherwood, Independence, Project 160-39-NRM 198 A, Montgomery Co., $13,636***to Western Paving & Constr. Co., Topeka, Project 73W-9, N.R.M. 447 B, Neosho Co., $36,364***to Geiger & Rutherford, Leavenworth, earthwork, culverts, 0.764 mi. Project 21-18-NRHM 496 A1, Norton Co., $15,210; earthwork, culverts, concrete paving 0.192 mi. Project 21-18-NRM 496 A2, Norton Co., $18,273***to W. B. Honska Constr. Co., Salina, Bridge 1, Project 21-18 NRH 496 A1, $17,796; Bridge 2, Project 21-18-NRH 496 A1, $4,566, both Norton Co.; Bridge 1, Project 36-24-N.R.H. 449 D, Washington Co., $21,520***to J. H. Shears Sons, Hutchinson, concrete paving 1.296 mi. Project 50S-20-NRM 399 G, Reno Co., $85,943***to H. J. Taylor Constr. Co., Salina, 0.685 mi. Project 81-16-NRM 44 C, Saline Co., $30,812***to H. T. Ritchie, Wichita, Project 81-6-NRM 130 D3, Sedgwick Co., $20,909***to A. L. Cook, Ottawa, earthwork and culverts 5.171 mi. Project NRS 480-A, Seward Co., $29,039***to Geo. W. Condon Co., 223 Grain Exch. Bldg., Omaha, Neb., earthwork, curbing, guttering 0.036 mi. Project 36-24-NRM 449 E, $690; earthwork, culverts 1.327 mi. Project 36-24-NRH 449 D, $32,336, Washington Co.***to E. W. King, Hesston, Bridge 1, Project 14-15A-NRM 445 A, Ellsworth Co., $2,185. Grand total $677,211. Bids Dec. 15.

Kansas—State Hy. Comn., Jetmore, to Geo. W. Condon Co., 223 Grain Exchange Bldg., Omaha, Neb. and Mead & Hardman, Alton, earthwork and culverts 11.004 mi. Project 50N-7-NRH 359-A, Hodgeman Co., $46,274; 6.06 mi. Project 83-10-NRH 248A, $36,279; Bridge 1, six 10 ft. x 6 ft. x 32 ft. rein.-con. spans, $4,372; Bridge 2, three 7 ft. x 4 ft. x 32 ft. rein.-con. spans, $1,407; Bridge 3, nine 9 ft. x 7 ft. x 32 ft. rein.-con. spans, $6,077, all foregoing on Project 83-10, NRH 248 A, Scott Co.***to Yancey Constr. Co., Abilene, Bridge 1, five 10 ft. x 10 ft. x 32 ft. rein.-con. spans, $4,557; Bridge 2, seven 8 ft. x 7 ft. x 32 ft. rein.-con. spans, $4,002, both on Project 50N-7-NRH 359-A, Hodgeman Co. Grand total $102,968. Bids Dec. 12. **P.W.A.** Rejected bids earthwork, culverts, sand graveling 1.001 mi. Project 83-10 N.R.H. 248 B, Scott Co.; bridges 3 and 4, Project 50N-7-NRH Hodgeman Co. Noted Nov. 30.

Kansas—State Hy. Comn., Medicine Lodge, concrete paving 1.582 mi. Project 81-7-NRH 130C, Sedgwick Co., to Roberts Constr. Co., Wichita, $51,744***Bridge 3, one 60 ft., nine 70 ft., one 60 ft. W.F. beam spans, Project 160-20-N.R.H. 451 B1, Barber Co., to Maxwell Constr. Co., Columbus, $61,570***Bridge 4, five 25 ft. rein.-con. deck girder spans, Project 160-20-N.R.H. 451 B1, Barber Co., to Banta Constr. Co., $7,757***sand gravel surfacing 1.554 mi. Project 59-1K-1461, Harvey Co., to E. Grinsman, Mt. Hope, $647. Grand total $121,718. Bids Dec. 11. **P.W.A.** Rejected bids Dec. 11, bridges 1 and 2, Project 160-20-N.R.H. 451 B1, Barber Co. Noted Nov. 30.

Kentucky—State Hy. Comn., Frankfort, grading, draining 1.377 mi. Carter Co. and grading, draining, traffic bound limestone surfacing 4.036 mi. Marion Co., to Ruth Bros., Frankfort, $19,936 and $29,901 respectively***grading, draining, 3.354 mi. Montgomery Co., to H. H. Miller Constr. Co., Jackson, $30,106***grading, draining 3.549 mi. Peonia-Munfordville Rd., S.P. 617-BG, Grayson Co. and 5.516 mi. same road S.P. 617-AG, Hart Co., to J. F. Mulligan, Inc., East View, $27,800 and $31,213 respectively***6.953 mi. Hart Co., to A. Snider, Danville, $30,091***7.001 mi. Jamestown-Albany Rd., N.R.H. 212-FG-G, Clinton and Russell Counties, to Cumberland Constr. Co., Burkesville, $92,794***four 50 ft. span bridge and earth approaches, and grading 0.289 mi. Allen-Lackey-Hindman Rd., N.R.M. 237-EB, Floyd Co., to Shields Constr. Co., Hazard, $37,866***bridge and grading approaches 0.321 mi. Madisonville-Sacramento Rd., N.R.H. 183-CBG, Hopkins and McLean Counties, to Albert Lyons & Co., Rogersville, Tenn., $37,917. Grand total $337,624. Bids Dec. 8 and Nov. 24. **P.W.A.**

Louisiana—State Hy. Comn., Baton Rouge, drainage structures and approaches on Lacassine-Welsh Hy. Jefferson Davis Parish, Project 3500-A, to Forcum-James Co., Dyersburg, Tenn., $19,505. Noted Nov. 23.

Maryland — State Roads Comn., Baltimore, combination concrete header and base course surfacing 3.89 mi. Contr. B-297-1-48, Federal Aid Project N.R.H. 7-A, Unit 1, Baltimore Co., to Thomas, Bennett & Hunter, Westminster, $207,750***4.31 mi. Contr. B-298-1-48, H-169-1-48, Federal Aid Project N.R.H. 7D, N.R.H. 7A, Unit 2, Baltimore Co., to Frank Carozza & Son, 2444 North Charles St., Baltimore, $226,814***1.85 mi. Contr. B-274-1-48, Federal Aid Project N.R.H. 286, Baltimore Co., to C. J. Langenfelder & Son, Phila. Rd. and Summit Ave., Rosedale, $94,649. **P.W.A.** Grand total $529,213. Bids Oct. 17.

Michigan—State Hy. Dpt., in lobby of Hotel Olds, Lansing, grading, shaping, culverts, etc., 0.315 mi. N.R.S. 65-17, Contr. 3, Ogemaw Co., to H. Richmond, Grosse Point Farms, Detroit, $14,438***grading, shaping, road drainage, concrete paving 0.685 mi. N.R.H.M. 3-25, Contr. 1, Allegan Co., to E. J. Vander Veen, Grand Rapids, $37,082***2.533 mi. N.R.S. 278-24, Contr. 2, St. Joseph Co., to Wm. H. Friedrich, Coldwater $66,130***2.646 mi. N.R.S. 2520-C-2 and N.R.S. 73-25 C-3, Genesee and Saginaw Counties, and 1.848 mi. N.R.H.M. 11-39, Contr. 2, Berrien Co., to Hillding Constr. Co., Bay City, $70,816 and $64,971 respectively***0.149 mi. N.R.M.25-21, Contr. 4, Genesee Co., to F. Porath, 8900 Hubbell St., Detroit, $13,501***grading, shaping, drainage, 2 course gravel surfacing 5.471 mi. N.R.S. 13-37, Contr. 1, Calhoun Co., to Brooks Constr. Co., Jackson, $42,616***grading, shaping, drainage, sand and concrete surfacing 4.116 mi. N.R.H.M. 7-1, Contr. 3, Baraga Co., to Thornton Bros. Co., Hancock, $124,650

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†Federal Government.

Streets and **Roads** (Continued)

***N.R.H. B1 of 78-9, Contr. 2, St. Joseph Co., to Peninsular Constr. Co., Grand Rapids, $10.541 ***grading, shaping, widening, gravel surfacing 6.53 mi. N.R.S. 14-28, Contr. 1, Cass Co., to Louis Garavaglia Co., 2223 Scott St., Detroit, $58,798. Grand total $503,543. Bids Dec. 8. P.W.A.

Missouri—State Hy. Comn., Jefferson City, to Lay Constr. Co. & Henderson Constr. Co., North Kansas City, graveling 3.635 mi. Lafayette Co. $11,286; 2.882 mi. same road $18,664; 3.369 mi. same road $22,946; 4.513 mi. same road $86,310***to Chany & Amyx, Branson, 1.895 mi. Barry Co. $1,197; 4.674 mi. Stone Co. $4,048***to E. W. Jewett, Shelbina, 4.417 mi. Scotland Co. $3,625; 0.89 mi. Scotland Co. $718; 2.954 mi. Monroe Co. $1,071; 3.159 mi. Monroe Co. $1,599***to A. Melberg, Cedar Rapids, Ia., 0.181 mi. Sullivan Co. $29,801; 4.512 mi. Carroll Co. $18,882***to Lee Van Horne, Jefferson City, 3.441 mi. Cooper Co. $10,389; 2.938 mi. same road $10,120***to T. C. O'Dell, Hannibal, 2.009 mi. Franklin Co. $23,415; 2.617 mi. same road $25,450; 2.774 mi. same road $20,586; 4.923 mi. same road $44,797; 4.447 mi. same road $46,071; 4.197 mi. same road, $37,937; 0.887 mi. same road $28,325***to H. H. Ruddell, Springfield, grading 4.533 mi. Webster Co. $27,633***to Knox & Penzel, Jackson, 2.529 mi. St. Francois Co. $18,894***to Martin Wunderlich, Jefferson City, 2.512 mi. Maries Co. $6,655***to J. A. Kerr, Ozark, 3.705 mi. Christian Co. $11,885***to Ackley Bros. Constr. Co., Kansas City, 1.481 mi. Lafayette Co. $5,032***to A. E. Walesby, Independence, 0.227 mi. Henry Co. $7,526***to F. W. Whitehead, Kahoka, 2.726 mi. Clark Co. $12,421***to E. D. Tyner Constr. Co., 1402 Elmwood St., Kansas City, concrete paving 1.783 mi. Mercer Co. $26,729; 2.827 mi. same road $39,433; 2.586 mi. Grundy Co. $32,516; 4.024 mi. same road $12,559; 2.647 mi. same road $27,223***to Carlon Constr. Co. and Chase Constr. Co., Maplewood, 4.563 mi. Saline Co. $60,152; 0.839 mi. same road $10,659; 0.371 mi. same road $12,559; 2.647 mi. same road $38,363***to Kelly & Underwood, Granby, 2.953 mi. Jackson Co. $73,624; 2.85 mi. same road $69,910***to Whipple & Irwin, Springfield, 0.186 mi. Laclede Co. $5,912***to E. K. Porter, Carrollton, 4.823 mi. Oregon Co., $26,178; 4.582 mi. same road $17,407; 2.282 mi. Miller Co. $17,453; 2.739 mi. Miller Co. $8,646***to Carte-Harlin Constr. Co., West Plains 3.219 mi. Oregon Co. $9,628; 5 mi. Oregon Co. $15,177*** to Campbell Schultz & Co. & H. C. Grunwald, Troy, 4.242 mi. Audrain Co. $12,795; 4.357 mi. Audrain Co. $17,581***to Hoover Bros. Constr. Co., 2716 McGee St., Kansas City, grading 2.972 mi. Henry Co. $5,353; 4.669 mi. same road $9,590; 4.964 mi. same road $22,415; 13.481 mi. same road $13,481***to C. I. Williams, Monett, 4.545 mi. Pitts Co. $22,976; 4.895 mi. same road $21,945; 3.698 mi. same road $8,795***to Nyer Constr. Co., Billings, 4.733 mi. Greene Co. $17,365; 4.792 mi. same road $14,168***to O. O. Fuller Constr. Co., Nevada, 3.312 mi. Henry Co. $8,003; 2.885 mi. same road $7,105. Grand total $1,259,921. P.W.A. Rejected bids Dec. 8, improving roads in Jasper, Montgomery, Cooper, Benton, Newton, Marion, and Audrain Counties. Bids Dec. 8.

Montana—State Hy. Comn., Helena, grading, crushed graveling 10.158 mi. Judith Basin Co., to Threet Bros., Lovell, Wyo., $49,991***1.058 mi. Lake Co., to Hall & Booth, Stanley, N. D., $35,771***1.676 mi. Teton Co., to T. S. Staunton, Great Falls, $8,888. Grand total $174,650. Grading, crushed graveling 5.68 mi. Wheatland Co. and 3.297 mi. Sweet Grass Co., force account. Bids Dec. 15. Noted Dec. 7.

North Dakota—State Hy. Comn., Bismarck, to F. M. Loutzenhiser, Bismarck, grading 9.077 mi. road in Sioux Co. $18,374***to Western Constr. Co., Williston, paving 1.152 mi. Williams Co. $40,280***to Megarry Bros., Bismarck, oil surfacing 9.5 mi. Ward Co. $52,002; 9.748 mi. Stark Co. $53,052; 24.604 mi. Cass Co. $126,023***to W. H. Noel, Jamestown, graveling 7.045 mi. McHenry and Bottineau Counties $12,884***to N. W. Constr. Co., Bismarck, 12.83 mi. McHenry Co. $17,872; 14.129 mi. Wells Co. $17,680; 9.171 mi. Williams Co. $17,214***to Advance Constr. Co., Fargo, 17.182 mi. Emmons Co. $15,719***to Minneapolis Bridge Co., 701 Metropolitan Life Bldg., Minneapolis, Minn., underpass and grading 0.183 mi. Pierce Co. $44,342***to Fargo Bridge & Iron Co., Fargo, box culvert in Barnes Co. $4,499***to Soo Line R.R. Co., St. Paul, Minn., underpass on same road $18,121. Grand total $438,062. Bids Dec. 15, awarded Dec. 15. P.W.A. Noted Dec. 7.

Oregon—State Hy. Comn., Salem, grading, surfacing 3.85 mi. Dallas-Coast Hy., Polk Co., to C. L. Leonard, Albany, $67,674***pile trestle, and grading, surfacing approaches on Jordon Valley Hy., Malheur Co., to O'Niel & Pierce, Portland, $19,256***0.5 mi. 82nd St. Base Line Hy., Mutnomah Co., to Jacobsen & Jensen, Portland, $34,330***grading 14 mi. Idaho-Oregon-Nevada Hy., Malheur Co., to S. H. Newell, Portland, $32,550***grading, surfacing 0.59 mi. Sixes River Sect. Curry Co., to J. W. and J. R. Hillstrom, Marshfield, $10,305 ***3.1 mi. Heppern Springs Hy., Moro Co., to Saxton & Looney, Corvallis, $34,330***6.4 mi. Pacific Hy., Linn Co., to United Constr. Co., Portland, $69,999***5,115 lin.ft. Pacific Hy., Marion Co., to L. C. Harold, Salem, $44,841. Grand total $313,285. Bids Nov. 15.

Pa., Phila.—Bituminous course A on concrete paving and broken stone base and existing brick pavement Chew St. from Gorgas St. to Belfield Ave., to Union Paving Co., Broad and Stiles Sts., $25,935.

Texas—G. Gilchrist, state hy. engr., Austin, limestone rock asphalt and road oil on crusher run limestone base course paving 14.026 mi. Hy. 72, N.R.H.-M 373-B, 20 ft., Lavaca Co., to R. Mitchell, 2701 Texas Ave., Houston, $77,696. Bids Nov. 27. P.W.A. Noted Dec. 7.

Texas—G. Gilchrist, state hy. engr., Austin, grading, small drainage structures 5.793 mi. Hy. 24, N.R.S. 687 C and D, 20 ft., Dickens and King Counties, to Womack-Henning Constr. Co., Sherman, $37,344. Est. $40,000. P.W.A. Bids Oct. 30.

†Utah—Pub. Rds., Ogden, grading, draining, crushed surfacing 7.215 mi. road in Cache and Rich Counties, to W. W. Clyde & Co., Springville, $105,294. Est. $121,858. Bids Dec. 6. P.W.A. Noted Nov. 20.

Wis., Shawano — City, curbing, guttering, rein.-con. paving streets, to Roger E. Kilby Co., 1112 Grove St., Evanston, Ill., $41,306. Est. $40,000. A. E. McMahon Co., Menasha, engrs.

Ont., Guelph—Wellington Co., grading, excavation, fill, culverts, graveling county roads. Mostly by day labor. Est. $125,000. J. M. Young, Harrison, engr.

EARTHWORK, IRRIGATION DRAINAGE AND WATERWAYS

PROPOSED WORK

Calif., Los Angeles—Rohl & Connelly, contractors, 4351 Alhambra Ave., were granted permit by Harbor Dpt. for construction fence, tracks, roadways, derricks, 40x90 ft. wharf, marine ways, grading, etc., at Berth 235. $40,000.

Ga., Brunswick—Glynn Co. plans dry dock and shed at St. Simons Island. $37,000. P.W.A. project. J. H. Johnston, C. & S. Bank Bldg., Atlanta, engr.

La., Oberlin—Louisiana Power Corp., F. H. Wilmot, pres., Oberlin, made application for P.W.A. loan of $5,300,000 for construction dam in Calcasieu River for development of irrigation and power in that section. Will furnish water to rice growers in Allen, Jeff Davis and Calcasieu Parishes. Floyd & Lockridge, Wilson Bldg., Dallas, Tex., engrs. Some time ago bids had been opened, but not awarded.

Mass., Revere—Commonwealth of Massachusetts, Metropolitan Dist. Comn., D. B. Keniston, comr., 20 Somerset St., Boston, plans concrete seawall shore protection southerly from Northern Circle. $45,000.

Mo., Joplin—Central Drainage Dist. Jasper Co., 231 McKinley Bldg., plans dewatering mineral lands adjacent to here. $450,000. Applied for loan under P.W.A. W. M. Stewart, 1001 North Moffett St., engr.

Mo., Parma—Drainage Dist. 28 New Madrid Co., G. M. Meier, secy., plans reclamation project. $80,950. Applied for $18,198 grant and $38,323 loan under P.W.A. F. M. Robbins, New Madrid, engr.

N. J., Beach Haven—Bd. Boro Council, Boro Hall, plans constructing steel bulkheads at Holyoke Ave. $75,000. Will seek loan under P.W.A.

Tex., Bay City—Matagorda Co. Conservation & Reclamation Dist. 1, c/o C. A. Erickson, Bay City, filed application with P.W.A. to finance removal of raft, debris, shell and earth from mouth of Colorado River. $116,300. H. J. Wilkins, Bay City, engr.

Tex., Corpus Christi—See "Bridges and Grade Crossings."

BIDS ASKED

†Ia, Dubuque—Jan. 11, by U. S. Eng., Federal Bldg., Rock Island, Ill., constructing Lock 11, in Mississippi River, 3.3 mi. upstream from here, incl. 600x110 ft. main lock, 360x110 ft. auxiliary lock, 600 ft. guide walls, also cofferdam, maintenance and removal of same, etc.

Okla., Ardmore—See "Contracts Awarded."

†Oregon—Jan. 3, by U. S. Eng., Custom House, Portland, 70,000 cu.yd. rein.-con. for Boonevile Dam.

†Texas—Jan. 4, by U. S. Eng., Galveston, redredging 230,000 cu.yd. in Double Bayou Channel and Anahuac Channel.

LOW BIDDERS

†Ariz., Yuma—Bureau Reclamation, Yuma, Dec. 20, constructing All-American Canal between Stas. 1130 and 1860, from Six Companies, Inc., Financial Center Bldg., San Francisco, Calif., $2,769,731. Noted Dec. 14.

†Ill, Alton—U. S. Eng., Custom House, St. Louis, Mo., Dec. 19, constructing twin locks for Lock and Dam 26, in Mississippi River, from John Griffith & Son, Builders Exch. Bldg., Chicago, $3,194,702. Noted Dec. 5.

†Wis., Lynxville—U. S. Eng., 615 Commerce Bldg., St. Paul, Minn., Dec. 15, constructing Lock 9 in Mississippi River, near here, from W. W. Magee Co., 118 Central Ave., St. Paul, Minn., $1,532,029. Noted Dec. 7.

CONTRACTS AWARDED

†California — U. S. Eng., Post Office Bldg., Sacramento, 12,500 tons stone along Sacramento River, to Lord & Bishop, Native Sons Bldg., Sacramento, $34,375. Bids Nov. 28. Noted Dec. 5 Daily.

†Delaware—U. S. Eng., Gimbel Bldg., Phila., Pa., dredging 53,700 cu.yd. from Little River, to Delaware Dredging Co., 139 South 3rd St., Phila., Pa., $13,263. Bids Nov. 28. Noted Nov. 23.

†Ill., Quincy—U. S. Eng., Rock Island, 1,200 tons structural steel for Lock 21, Mississippi River to Mississippi Valley Structural Steel Co., 3117 Big Bend Rd., St. Louis, Mo. Noted Dec. 14 under "Contracts Awarded, Unclassified."

†Ky., Hickman—U. S. Eng., Post Office Box 97, Memphis, Tenn., 182,000 cu.yd. levee work, to Tully Costello Co., 30 North LaSalle St., Chicago, Ill., $50,960. Bids Dec. 7. Noted Nov. 23.

La., New Orleans—New Orleans Public Belt R.R. Comn., F. H. Joubert, constructing 37,200 cu.yd. earth embankment for railroad approach to East end of Mississippi River Bridge, Jefferson Parish and 1,500 cu.yd. earth removed for canals, to J. Harris, 3615 D'Hemecourt St., $22,042. Bids Dec. 1, awarded Dec. 12. Noted Dec. 5 Daily.

†Mass., Cohasset—Superintendent Lighthouses, Dpt. Commerce, Wash., D. C., steel sheet pile bulkhead and fill at Cohasset Harbor, to Blakeslee-Rollins Corp., 79 Cambridge St., Boston, $9,935. Bids Nov. 27, awarded Dec. 15. Noted Nov. 29.

†Michigan—U. S. Eng., 410 Custom House, Detroit, dredging 217,220 cu.yd. and removing 31,200 cu.yd. from channel between Pond Island and Mackinac Island, to Dunbar & Sullivan Dredging Co., 2312 Buhl Bldg., Detroit, $394,551. Bids Dec. 5. Noted Nov. 23.

Okla., Ardmore—State, c/o Dpt. Waterways, Power & Flood Control, Oklahoma City, earthern dam, 150 ft. high, spillway and lake by local labor, under Counties Made Work Committees. $90,000. J. C. Milliken, state engr. Noted Nov. 23.

UNCLASSIFIED

PROPOSED WORK

Calif., La Mesa—RECREATIONAL CENTER —Defeated bonds for swimming pool, tennis court, etc. Est. $35,000. Work to be done with co-operation from federal funds.

Conn., Lakeville—STABLES, etc.—T. S. Hose, 551 5th Ave., New York, plans developing 850 acre site for horse breeding and poultry farms, incl. stables and poultry farm structures, also improvements to 10 acre lake development, Maltby Rd. To exceed $45,000. Engineer not appointed.

Kan., Great Bend—SWIMMING POOL—City, W. L. Jacobs, clk. made application for P.W.A. grant of $12,850 and $30,000 loan to finance construction 100x200 ft. rein.-con. swimming pool. J. Martin Hall, Great Bend, engr.

†Kan., Leavenworth—HANGARS—Con. Q.M. rejected bids fireproofing and insulating hangars, part of $50,000 project.

Minn., St. Paul—UNDERPASS—City made plans underpass to replace overhead bridge over Minnesota Transfer Ry. Co. tracks at Midway. $350,000. G. M. Shepard, city engr.

Mo., Webb City—PARK and SWIMMING POOL—City plans municipal park, swimming pool and community center. $34,119. Applied for loan and grant under P.W.A. F. R. Hogdon, archt.

N. H., Concord—CREMATORY—City applied for Federal loan under P.W.A. to finance construction 1 story, brick, stone, granite crematory. $49,000. Andrews, Jones, Biscoe & Whitmore, 50 Congress St., Boston, Mass., archts.

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†*Federal Government.*

Unclassified (Continued)

N. J., Jersey City—STADIUM—Jersey City Baseball Club, Inc., J. P. Corbett, pres., 40 Journal Sq., preliminary sketches baseball stadium, Pacific Ave. and Grand St. $25,000 or more. Will apply for P.W.A. loan.

N. Y., Brooklyn—BATHHOUSES, etc.—Dpt. Parks, Arsenal Bldg., Central Park, New York, plans altering 3 story, brick, concrete bathhouses, also bulkheads and walls, Concourse Dr., Surf Ave. and West 5th St.

N. C., Henderson—STREET LIGHTING SYSTEM—City filed application with P.W.A. for loan to finance installation modern street lighting system. $34,000. I. B. Watkins, mayor.

Okla., Boley—NATURAL GAS SYSTEM—City plans natural gas system. $35,000. Applied for loan under P.W.A. S. Embree, Holdenville, engr.

Okla., Cushing—GAS GATHERING SYSTEM—Oklahoma Western Gas Co. plans natural gas gathering system. $1,475,000. R. M. Tuttle, city engr. Applied for loan under P.W.A.

Okla., Frederick—DISTRIBUTION SYSTEM—City plans electric distribution system. $22,000. Applied for loan under P.W.A. P. S. Donnell, Oklahoma City, engr.

Mann., Winnipeg—BARRACKS—Dpt. National Defence, Ottawa, Ont., plans constructing barracks for the 90th Winnipeg Rifles. $500,000. **Maturity in spring.**

Tex., Lubbock—ELECTRIC SYSTEM IMPROVEMENTS, etc.—City, c/o W. H. Rodgers, mgr., Lubbock, filed application with P.W.A. for loan to finance electric and power system improvements, $40,000; also installing natural gas system, $1,700,000. L. Goodrich, Austin, engr.

Tex., Marlin—ELECTRIC LIGHT and POWER SYSTEM—City, c/o C. R. Glass, mayor, filed application with P.W.A. to finance construction electric light and power system. $175,000. L. Goodrich, Marlin, engr.

Tex., San Angelo—FISH HATCHERY—Bureau Fish & Game, Wash., D. C., soon takes fish hatchery, incl. 100 acres of ponds and grounds, tool house. $29,000. C. B. Grater, San Marcos and San Angelo, engr. Noted Aug. 31.

BIDS ASKED

†Md., Fort George G. Meade—STABLES—Jan. 2, by Con. Q.M., stables. $37,000.

†Mich., St. Joseph—PIER—U. S. Eng., Milwaukee, Wis., taking bids 1,348 lin.ft. concrete superstructure on crib pier here. (Date not set.)

N. Y., New York—TUNNELS, etc.—Feb. 6, by Port of New York Authority, G. R. Dyer, ch., 111 8th Ave., shield driven tunnel and shafts of Midtown Hudson Tunnel between Weehawken, N. J., and New York, N. Y.

Wash., Seattle—NATATORIUM—See "Contracts Awarded."

LOW BIDDERS

†T. H., Pearl Harbor—FLEET MOORINGS—Yards & Docks, Navy Dpt., Wash., D. C., Dec. 13, fleet moorings, Spec. 7093, from Hawaiian Dredging Co., Honolulu, (1) $1,427,700 (2) $1,314,500 (3) $1,187,500 (4) $1,059,900 (5) $935,000 (6) $828,800 (7) $714,000.

CONTRACTS AWARDED

†Calif., San Diego—LANDING FIELD IMPROVEMENTS—Yards & Docks, Navy Dpt., Wash., D. C., improving landing field, oiling Area K, at Naval Air Station, Spec. 7572, to Miracle Co., 4751 Monroe St., $9,690 (30 days).

†Kan., Fort Riley—PAVED APRONS, HANGAR, etc.—Con. Q.M., paved aprons, runways and hangar, to D. Walters, Manhattan, $22,086.

†La., Shreveport—HEATING, etc.—Con. Q.M., heating, plumbing and electrical work in hangars at Barksdale Field, to Joth Plumbing & Heating Co., Shreveport, $29,700. Bids Dec. 4, awarded Dec. 14.

Md., Baltimore—TRACK REPLACEMENT—See "Materials and Equipment."

†Mass., Woods Hole—WHARF—Superintendent Lighthouses, 2nd Dist., 37 Marginal St., Chelsea, extending timber wharf, to A. L. Ames, Woods Hole, $10,868. Bids Nov. 22, awarded Dec. 15.

†Mo., St. Louis—TOWBOAT REPAIRS—U. S. Eng., repairing towboat General James F. Indoe, to Dravo Contg. Co., Neville Island, Pittsburgh, Pa., $13,750. Bids Dec. 6.

†Montana—STONE—U. S. Eng., Kansas City, 100,000 cu.yd. stone in various piles along Saco-Turner Branch of Great Northern Ry., to Tobin Quarries, Inc., 220 West 39th St., Kansas City, Mo., at $1.95 per cu.yd.

†Tex., Fort Sam Houston—RADIO TRANSMITTER BUILDING—Con. Q.M., 1 story 40x60 ft., clay tile, stucco radio transmitter building and 34x112 ft. annex, to Banspach Bros., 248 West Josephine St., San Antonio, $17,250. Bids Dec. 4. **P.W.A.**

†Va., Quantico—HANGAR—Yards & Docks, Navy Dpt., Wash., D. C., relocation and addition to Hangar 29, at Marine Corps Flying Field, Spec. 7082, to H. J. Smith Constr. Co., 110 West 34th St., New York, $49,100 (150 days).

Wash., Seattle — NATATORIUM — Weldon Constr. Co., 7101 Dayton Ave., 130x242 ft., glass-domed natatorium, dome 165 ft. long, 35 ft. above surface of swimming pools, 4 swimming pools, largest 50x165 ft., Alkili Ave., own forces. $100,000.

MATERIALS AND EQUIPMENT

PROPOSED WORK

METAL CULVERT PIPE, etc.—**Albion, Ind.**—Bd. Comrs. Noble Co., bids in January gravel as needed, year's supply metal culvert pipe, 10 cars road oil. A. L. Pursel, comr.

GRAVEL, etc.—**Angola, Ind.**—Bd. Comrs. Steuben Co., bids in February, 60,000 yd. gravel, 1,500 ft. metal culvert pipe, 20 cars road oil, 10 cars tar, 20,000 ft. bridge lumber. H. C. Doty, comr.

CRUSHED STONE, etc.—**Bedford, Ind.**—City bids in January 50 tons crushed stone, 3 cars road oil, and 1 car asphaltic materials.

CONDENSER — **Columbia City, Ind.** — City plans 1,250 kva. turbine condenser and auxiliaries, for light plant. $47,000. J. Moore & Son, 838 K. of P. Bldg., and Bevington & Williams, 731 Woodlawn Ave., both Indianapolis, engrs. Former bids rejected. Applied for loan under P.W.A.

CRUSHED STONE, etc.—**Huntington, Ind.**—City bids in January 100 tons crushed stone, 1 car road oil, 5 cars asphalt material and 50 tons patching material.

CRUSHED STONE, etc.—**Laport, Ind.**—City bids in January 8 cars crushed stone; 50 bbl. cutback asphalt.

STONE, etc.—**Lindon, Ind.**—City soon takes bids 2 cars crushed stone, 3 cars gravel, 300 ft. metal culvert pipe, 56,000 gal. road oil and 10 bbl. tar.

CRUSHED STONE, etc.—**Newcastle, Ind.**—Bd. Comrs. Henry Co. soon takes bids 15,000 tons crushed stone; culvert pipe as needed 12,000 gal. tar; oil and grease. G. Pring, comr.

CRUSHED STONE—**Mount Vernon, Ind.**—Bd. Comrs. Posey Co. bids in January, 500 tons crushed stone, 15,000 cu.yd. gravel, 1,500 ft. metal culvert pipe, 5,000 gal. tar, and 20,000 ft. bridge lumber. T. Hunter, comr.

CRUSHED STONE, etc.—**North Vernon, Ind.**—Bd. City Comrs. bids in January, crushed stone, 2,000 ft. metal culvert pipe, 50,000 ft. bridge lumber, 5 bbl. oil, and 5 bbl. grease. R. Camp, comr.

PUMPS — **Needham, Mass.** — City, Water Comrs., City Hall, soon takes bids 2 pumps at Newton Water Reservation. To exceed $1,000. Weston & Sampson, 14 Beacon St., Boston, engrs.

FIRE HYDRANTS—**Chattanooga, Tenn.**—Municipality plans purchasing 80 fire hydrants and installing same by separate contracts and day labor. Also plans application for P.W.A. loan.

BIDS ASKED

AUTO TRANSFORMERS—**Los Angeles, Calif.**—Jan. 29, by A. J. Holm, city purch. agt., City Hall, furnishing, delivering (1) 6 (1A) 7 (1B) and (1B-1) 7 (1C) 6 (1C-1) 7 (1D) 6 (1D-1) 7 oil immersed, forced air cooled outdoor auto transformers, all incl. spare parts and necessary oil (aA) alternate indicated to be in accordance with alternative items in specifications (a) f.o.b. cars, Los Angeles (b) f.o.b. cars bidders factory or shipping point, to Dpt. Water & Power, auto transformers, Spec. 3265. To exceed $2,000.

SYNCHRONOUS CONDENSERS—**Los Angeles, Calif.**—Feb. 5, by A. J. Holm, city purch. agt., City Hall, synchronous condensers, Spec. 3267, as follows (1) 3-hydrogen cooled, outdoor type, complete (tools and spare parts) (2) 4, ditto; (1-alt.) ditto alternate to Item (1) (2-alt.) 4, ditto alternate to Item (2) (a) 3, f.o.b. cars Los Angeles (b) f.o.b. cars bidders shipping point, full freight allowed to Los Angeles (c) f.o.b. cars bidders shipping points.

RAILS—**San Francisco, Calif.**—Western Pacific R.R., Mills Bldg., San Francisco, taking bids 26,000 tons rails and fasteners. Est. about $1,000,000.

TRUCK SCRAPERS—**Indiana**—Jan. 2, by State Hy. Comn., J. D. Adams, chn., Indianapolis, 4-6 scrapers of hydraulic pneumatic or spring blade type suitable for use on trucks of from 2-3½ ton capacity, f.o.b. Crawfordsville, Greenfield, Fort Wayne.

GUARD RAIL POSTS, etc.—**Indiana**—Jan. 3, by State Hy. Comn., J. D. Adams, chn., Indianapolis, 800-1,000 guard rail posts, f.o.b. Tipton: miscellaneous hardware; 1,301 lin.ft. corrugated metal culvert pipe, in vicinity of Middletown; 1,168 lin.ft. corrugated metal culvert pipe on road between Kirklin and Clinton—Boone Co. line; 1,500-2,500 tons crushed aggregate gravel or slag, f.o.b. Bremen; 800-1,200 tons gravel at plant in Terre Haute Sub-district.

ROAD MAINTAINERS—**Indiana**—Jan. 4, by State Hy. Comn., J. D. Adams, comr., Indianapolis, 3-7 drag type road maintainers.

CRUSHED STONE, etc.—**Paoli, Ind.**—Jan. 1, by Bd. Comrs. Orange Co., 20,000 cu.yd. crushed stone, 2,000 ft. metal culvert pipe. D. McCart, aud.

AUTOMATIC SPRINKLERS — **Binghamton, N. Y.** — Jan. 17, by Dpt. Mental Hygiene, State Office Bldg., Albany, automatic sprinklers at Binghamton State Hospital.

†CABLE, etc.—**Brooklyn, N. Y.**—Jan. 2, by Signal Supply Officer, Army Base, 58th St. and 1st Ave., 8,000 ft. telephone cable; 302,000 ft. wire; and 4,510 sleeves types FT-75, 76, 77, 79 and 82, per U. S. Army Spec. 71-439, Lead, used for splicing end covered cable.

†CABLE, etc.—**Brooklyn, N. Y.**—Jan. 8, by Signal Supply Office, Army Base, 58th and 1st Ave., 10,500 ft. cable and 3 reels.

RAIL, TRACK BOLTS, etc.—**New York, N. Y.**—Jan. 3, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., rail, track bolts, end inclines, joint bars, for Independent City-Owned Rapid Transit Railroad System.

†FUEL OIL DIESEL ENGINE—**Wilmington, N. C.**—Jan. 2, by U. S. Eng., 6,000 gal. fuel oil diesel engine.

CONTRACTS AWARDED

CEMENT—**Los Angeles, Calif.**—A. J. Holm, city purch. agt., City Hall, 600 bbl. cement per mo. from Jan. 1, 1934, to June 30, 1934, f.o.b. cars 2445 McPherson St., Spec. 3259, to California Portland Cement Co., Pacific Mutual Bldg., $8,856. Bids Dec. 5, awarded Dec. 18.

CHLORINE RESIDUAL CONTROLLER, etc.—**Los Angeles, Calif.**—City, A. J. Holm, purch. agent, City Hall, furnishing, delivering chlorine apparatus, etc., Spec. 3261, incl. one chlorine residual controller, one vacuum regulator, one electric time impulse recorder, to Wallace & Tiernan Sales Corp., 3923 West 6th St., $3,100. Bids Dec. 4, awarded Dec. 15. Noted Dec. 7.

CONVEYING and SCREENING EQUIPMENT, etc.—**Los Angeles, Calif.**—Metropolitan Water Dist., 306 West 3rd St., furnishing conveying and screening equipment, Bid 18113, to Stephens-Adamson Mfg. Co., 2227 East 37th St., Vernon, $1,450***apron feeder, Bid 18113, f.o.b. cars and/or trucks at factory, to Conveyor Co., Inc., 3306 East Slauson St., Vernon, $1,223*** vibrating screens, Bid 18113-C, f.o.b. cars or trucks at factory, to Standard Steel Works, 5001 South Boyle Ave., Vernon, $2,131. Grand total $4,804. Bids Dec. 4.

COPPER WIRE—**Los Angeles, Calif.**—Metropolitan Water Dist., 306 West 3rd St., S. A. Joseph, purch. agt., 10,000 ft. copper wire, stranded T-B-WP M.H.D. No. 6, and 30,000 copper wire, stranded DBRC M.H.D. No. 6, Bid No. 18571, to General Electric Supply Co., 385 East 2nd St., $1,091. Bids Dec. 1, awarded Dec. 18.

LINER PLATES, etc.—**Los Angeles, Calif.**—Metropolitan Water Dist., 306 West 3rd St., F. E. Weymouth, engr., 1,975 tons liner plates and structural steel ribs for tunnel supports for 15 ft. 3 in. and 16 ft. tunnels, Spec. 63, to Youngstown Steel Car Co., 519 Delta Bldg., Los Angeles, and Niles, O., $143,170. Bids Dec. 4, awarded Dec. 15.

REINFORCING STEEL—**San Quentin, Calif.**—State Purchasing Bureau, Sacramento, 125,-

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†*Federal Government.*

Materials, etc. (Continued)

000 lin.ft. 1¼ in. and 30,000 lin.ft. ⅜ in. reinforcing steel for San Quentin Penitentiary, to Truscon Steel Co., Atlas Bldg., San Francisco, $2,676. Bids Dec. 6, awarded Dec. 12. Former contract **rescinded.**

STEEL RAILS—**Baltimore, Md.**—Western Maryland R.R., H. R. Pratt, Standard Oil Bldg., ch. engr., 2,000 tons 90 lb. rails and quantity of rail joints, to Carnegie Steel Co., Carnegie Bldg., Pittsburgh, Pa. Owners will make track replacements by day labor.

†VENTILATING FANS, etc.—**Boston, Mass.**—Bureau Supplies & Accounts, Navy Dpt., Wash., D. C., ventilating fans and equipment at Boston, Navy Yard, to Reliance Electric & Eng. Co., 89 Broad St., Boston, Mass.; $22,793. Awarded Dec. 18.

†MOTOR GENERATOR SETS—**Chelsea, Mass.**—Superintendent Lighthouses, Dpt. Commerce, 37 Marginal St., three 5 kw. and one 20 kw. motor generator units, to Fairbanks-Morse & Co., Inc., 178 Atlantic Ave., Boston, $6,583. Bids Dec. 7 and 8, awarded Dec. 19. Noted

RAILS—**Detroit, Mich.**—Dpt. Street Railways, Shoemaker and St. Jean Sts., 2,700 tons street railway rails for municipal railways, to Bethlehem Steel Co., Bethlehem, Pa. Est. exceeds $100,000.

CULVERT PIPE—**Mississippi**—E. D. Kenna, dir. State Hy. Comn., Jackson, 1,100 ft. 18 in. and 450 lin.ft. 24 in. culvert pipe N.R.S. 233, f.o.b. Yazoo City and 1,100 lin.ft. 18 in. and 400 lin.ft. 24 in. culvert pipe, N.R.S 234, f.o.b. De Kalb, to Faulkner Concrete Pipe Co., Hattiesburg, $2,575 and $2,640 respectively.

TRACK FASTENINGS, etc.—**Phila., Pa.**—Pennsylvania R.R., E. E. Temple, ch. engr. Eastern Region, Broad St. Sta., furnishing 13,000 tons track fastenings, tie plates to Weirton Steel Co., Grant Bldg., Pittsburgh; 12,000 tons to Republic Steel Co., 4th St., Pittsburgh; remaining 26,000 tons to various companies. Est. about $2,000,000.

FOREIGN

England, Birmingham—Bakelite Corp., 247 Park Ave., New York, L. M. Rossi, in charge, plans plant addition. $200,000.

New Zealand, Christchurch—Jan. 17, by City Clerk, supplying single phase and 3 phase power transformers for 10,500/240 volts and 10,500/415 volts.

PUBLIC BUILDINGS

PROPOSED WORK

Ariz., Florence—State, Phoenix, plans by Lesher & Mahoney, Phoenix, juvenile penetentiary. $350,000 loan applied for under P.W.A.

Calif., Bell—Los Angeles Bd. Educ. plans by O. G. Bowen, 1144 South Grand Ave., Los Angeles, repairing, reconstructing and reinforcing main building Shop Buildings 1 and 2, and physical education building at Bell High School, $172,500.

Calif., Los Angeles—Bd. Educ., Technical Advisory Bd., consisting of A. E. Sedgwick, P. Jeffers and J. Austin, submitted to Bd. Educ. on report on estimated cost of rehabilitating and rebuilding Los Angeles Schools damaged in earthquake of Mar. 10. Costs of repair, covering 767 masonry buildings, 133 wood frame structures are classified: high schools (masonry) $14,460,372; Junior colleges (masonry) $386,338; elementary schools (masonry) $16,130,307; wood frame buildings $250,000. Total est. $31,277,017. Noted Nov. 30.

†**Calif., Montebello**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans by Walker & Eisen, 708 Pacific Commerce Bldg., Los Angeles, post office. $45,100 allotted by P.W.A.

Calif., Visalia—Supervs. Tulare Co., made application to P.W.A. for $39,251 grant to be used in financing construction of 3 story, rein.-con. county courthouse addition. Est. $138,698. E. J. Jump, Rowell Bldg., archt. Noted Oct. 19.

Conn., Berlin—Town, School Com., plans by Towner & Sellew, 329 Main St., Middletown, 2 story, basement, 62x175 ft., brick, stone school, incl. 10 rooms, cafeteria, auditorium and gymnasium, Berlin St. $150,000.

†**Conn., Danielson**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans brick, stone post office. $62,700. Taking bids on site.

Conn., Fairfield—Town, Bd. Selectmen, Town Hall, Post Rd., sketches by D. T. Domonkos, Post Rd., brick, steel, stone, town hall to house police department and town officials. $150,000.

Conn., Greenwich—Town, Bd. Educ., plans by Guilbert & Betelle, 20 Branford Pl., Newark, N. J., brick, steel high school addition, Field Pt. $575,000. $165,000 P.W.A. grant and 4% loan. Noted Jan. 19.

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Conn., Windsor—Town, Bd. Selectmen, Judge A. W. Olds, chn. Building Com., plans by C. D. Adams, 71 Preston St., 2 story, brick high school, Bloomfield Ave. $105,000.

†**D. C., Wash.**—Dpt. Interior plans power plant building. $460,000 allocated by P.W.A.

Georgia—Georgia School Dpts., various locations, plans repairing schools at Carrollton, $15,800; Dahlonega, $20,000; Americus, $4,200; Albany, $8,600; college Tipton, $26,000; college, Experiment Sta., $700; city schools, Douglas, $16,375; Valdosta, $10,000; Savannah, $10,000; Statesboro, $19,000; Cochran, $14,500; Milledgeville, $26,400; Athens, $56,100; Georgia Tech., Atlanta, $60,605. P.W.A. project. J. H. Johnston, C. & S. Bank Bldg., Atlanta, engr.

Georgia — Bd. Regents, Georgia University System, State Capitol, c/o H. Spalding, chn. State Capitol, Atlanta, plans universities and colleges. $3,600,000 fund approved by P.W.A. J. H. Johnston, Citizens & Savings Bank Bldg., Atlanta, engr. Noted Nov. 30.

Ga., Cedartown — City, plans city hall, 3 schools, fire station. Est. $155,000. Tentative loan approved. O. C. Poundstone, 101 Marietta St., Atlanta, archt. Noted July 20.

Ill., Belleville—Belleville Township High School Bd., voted $200,000 bonds high school addition. Applied for $60,000 grant and $140,000 loan under P.W.A. O. W. Rubach, Belleville, Bank Bldg., archt. Noted Nov. 23.

Ill., Knoxville—Bd. Educ. plans by W. H. Schulzke, Moline, high school, gymnasium and office. $175,000. Will hold election, and apply for loan under P.W.A.

†**Ill., Woodriver**—Treas. Dpt. at office Sup. Archt., Wash., D. C., plans rein.-con., brick, U. S. Post Office. $71,500 allotted under P.W.A. Bids Dec. 14 for site.

Ind., Terre Haute—Comrs. Vigo Co., J. M. Probst, aud., Court House, plans remodeling orphans home, water system, plumbing fixtures, stokers. $17,750.

La., Baton Rouge—Louisiana State University filed application for $101,375 P.W.A. loan for constructing power plant, incl. generating equipment, also for $45,478 loan for extensions to heating plant. Weiss, Dreyfous & Seiferth, Architects Maison Blanche Bldg., New Orleans, engrs.

Kan., Olathe—State, State House, Topeka, plans by J. W. Radotinsky, state archt., administration building at State School for Deaf. $185,000. Will apply for P.W.A. loan and grant.

Md., Hamilton (sta. Baltimore)—City of Baltimore, Public Improvement Comn., City Hall, Baltimore, plans by Clyde & Nelson Friz, Lexington Bldg., Baltimore, and soon takes bids 2 story, basement, addition to school. $120,000. Kublitz & Konig, Emerson Tower, Baltimore, engrs.

Mass., Boston—City, Fire Dpt., 60 Bristol St., plans by G. E. Robinson, 80 Federal St., brick, stone fire station, concrete found., Hanover St. To exceed $150,000. Noted Aug. 10.

Mass., Chelsea—City, L. F. Quigley, mayor, City Hall, plans municipal light plant. Engineer not appointed.

Mass., Medford—City, J. H. Burke, mayor, J. S. Kadesch, supt. schools, City Hall, plans concrete, steel, brick, stone addition to Senior High School, to exceed $150,000; also plans addition to elementary schools in North Medford and South Medford, to exceed $150,000. Architect not appointed.

Mass., Norfolk—Commonwealth of Massachusetts, Supt. State Prison Colony, Norfolk, and Dpt. Correction, State House, Boston, plans by McLaughlin & Burr, 88 Tremont St., Boston, brick assembly building, concrete found., at State Prison Colony. To exceed $150,000. P.W.A. R. D. Kimball Co., 6 Beacon St., Boston, engrs.

Mass., Pittsfield—City, School Bd., City Hall, J. P. Moore, mayor, plans 2 story, basement, brick, concrete, stone elementary school, Holmes Rd., Williams St. and Pomeroy Ave. To exceed $150,000. Architect not appointed.

Mass., Quincy—City, Mayor's Office, City Hall, sketches by P. Coletti, 168 Dartmouth St., Boston, 3 story, basement, concrete, brick granite hospital administration building, concrete found. $150,000. Will apply for P.W.A. loan.

†**Mass., Woods Hole**—U. S. Coast Guard, 408 Atlantic Ave., Boston, plans concrete, brick keepers building, at U. S. Coast Guard Station.

Mich., Battle Creek—Battle Creek General Hospital plans by L. J. Sarvis, Battle Creek, and Berlin & Swern, 19 South La Salle St., Chicago, Ill., 4 story, basement, brick, steel, stone, rein.-con. hospital. $243,000. P.W.A. to be petitioned for aid in financing. Noted Oct. 12.

Minn., Devils Lake—City voted $400,000 municipal electric light plant. Burns & McDonnell, 197 West Linwood Blvd., Kansas City, engrs.

Mo., Clayton—St. Louis Co., c/o Court House plans 4 story, basement, 56x216 ft., rein.-con., brick and terra cotta county hospital addition $442,000. Applied for loan under P.W.A. and will hold bond election. O. J. Krieg, Wainwright Bldg., St. Louis, archt. C. R. Kammerer, Court House, co. engr. Noted Nov. 9.

Mo., Clayton—St Louis Co., County Court House, plans 7 story, basement, brick, stone, steel court house and jail with 6 story, 118x220 ft. wings. $1,500,000. $138,000 grant allotted on passage on bond issue. O. J. Kreig, 916 Wainwright Bldg., St. Louis, archt. C. R. Kammerer, County Court, engr. Noted Oct. 12.

Mo., Greenfield—Dade Co., c/o R. D. Payne, presiding judge, County Court, plans by Bonsack & Pearce, Inc., 411 Olive St., St. Louis, rein.-con., brick, stone court house. $111,100. Applied for $26,100 grant and $85,000 loan under P.W.A.

Mo., Jefferson—State, c/o G. B. Park, gov., Jefferson City, plans new buildings, additions, repairs and remodeling at state eleemosynary and penal institutions. $13,400,000. Applied for $3,400,000 grant and $10,000,100 loan under P.W.A. F. Wallace, Kansas City, archt.

Mo., St. Louis—Bd. Educ., 911 Locust St., making plans high school, Kingshighway and Arsenal St., $1,200,000; Educational Museum adjoining Hadley Vocational School, $75,000; Delaney School addition, and remodeling, repairing other schools, Total $2,500,000. Applied for $500,000 grant and $2,000,000 loan under P.W.A. E. T. Friton, building comr., archt. and engr. Noted Jan. 19.

Mont., Billings—Bd. Educ., voted $400,000 for 3 story, 180x260 ft., school addition and 2 story, school addition. C. C. Cohagan, Hedden Bldg., Billings, archt. Funds allotted by P.W.A. Noted Nov. 23.

Mont., Warmsprings—State, c/o Hospital for Insane, H. A. Bolton, supt., plans hospital building, men's dormitories, office and physicians apartments. $370,000.

N. H., Andover—Town, E. P. Freeze, supt. schools, Bristol, plans by H. E. Mason, 15 Prospect St., Leominster, Mass., 2 story, basement, 60x100 ft., brick, stone, granite high school, $150,000. Will apply to P.W.A. for loan. Noted Apr. 14, 1932.

N. H., Glencliff—State, Dpt. State Sanitoriums, State House, Concord, plans 2 story, basement, brick, tile, stucco hospital, concrete found., at State Sanitorium. C. R. Whitcher, 814 Elm St., Manchester, archt. To exceed $150,000. P.W.A.

N. J., Belleville—Bd. Freeholders Essex Co., Court House, Newark, plans brick, steel tuberculosis hospital, plain found., at Isolation Hospital. $105,000 or more. May seek P.W.A. funds.

N. J., Jersey City—Bd. City Comrs., City Hall, sketches by J. T. Rowland, Jr., 30 Journal Sq., nearing completion brick, steel laboratory building, garage, plain found., Medical Center. $105,000 or more. Applied for loan under P.W.A.

N. J., Millington—Bd. Educ., Passaic Twp., G. Morrell, pres., Midvale Ave., plans by W. Slifer, 10 Park Ave., Morristown, 1 story, basement, brick, steel school. $105,000. Will ask loan under P.W.A. Noted Oct. 5.

N. J., New Market—Bd. Educ., Picataway Twp., W. E. Ohland, clk., Dunellen, plans by J. N. Pierson & Son, Natl. Bank Bldg., Perth Amboy, 2 story, basement, brick, steel high school, plain found. $105,000. Applied for P.W.A. loan

N. J., Verona — Bd. Freeholders Essex Co., Court House, plans aged convalescent building, brick, steel, plain found., at Essex Mountain Sanatorium. $105,000 or more. May seek P.W.A. loan.

N. Y., Brooklyn—Dpt. Hospitals, Municipal Bldg., New York, revised plans by C. B. Meyers, 31 Union Sq., 2 story, 82x87 ft. out-patients' building, at Greenpoint Hospital, Kingsland and Maspeth Aves. To exceed $200,000.

N. C., Asheville—City, City Hall, made application for loan to finance construction 3 story, basement, brick, limestone convention hall. $300,000. L. Gudger, Asheville, archt.

N. C., Gastonia — Gaston Bd. Educ., R. L. Stowe, chn. Bd. Comrs., Belmont, plans application for P.W.A. loan for 2 large grammar schools. $100,000.

N. C., Morganton—Burke Co. Bd. Educ., W. N. Claywell, chn. Co. Comrs., filed application with P.W.A. for loan to build schools in Burke Co. $140,000.

†*Federal Government.*

Public Buildings (Continued)

N. C., Yadkinville—Yadkin Co. School Bd. filed application for P.W.A. loan for 2 new brick buildings and additions to 5 others. $186,300.

N. D., Dickinson—Bd. Educ., plans 3 story, 120x168 ft., brick, rein.-con. high school. Applied for $155,700 loan and grant under P.W.A. W. F. Kurke, Fargo, archt.

Okla., Ardmore—City plans school additions. $124,000. Applied for loan under P.W.A. P. S. Donnell, Oklahoma City, engr.

Okla., Chickasha—Grandy Co. voted $200,000 bonds, 2 story, basement court house, Main St. P. Harris, Chickasha, archt. Noted Nov. 30.

Okla., Enid—School Bd., plans high school extension. $120,445. Applied for loan and grant under P.W.A.

Okla., Frederick—City plans municipal electric plant. $175,000. Applied for loan under P.W.A. V. V. Long & Co., Colcord Bldg., Oklahoma City, engrs.

Okla., Norman—City plans election Jan. 9, $350,000, for municipal light plant. F. Cobb, Norman, engr.

Okla., Pawnee—City defeated $43,000 bonds for municipal light plant. $43,000. J. A. McDaniel, Pawnee, engr. Noted Dec. 7.

Okla., Shawnee—City plans electric light plant. $175,000. Applied for loan under P.W.A. P. S. Donnell, Oklahoma City, engr.

Pa., Phila. — Bd. Inspectors, Philadelphia County Prison plans county prison south of Townsend Rd. to Poquessing Creek. $1,000,000.

R. I., Bristol—Town, E. S. Maples, supt. Schools, plans by Howe & Church, 1014 Industrial Trust Bldg., Providence, for Robt. Shaw Andrews grade school, 2 story, basement, irregular sized brick, stone, concrete found. To exceed $150,000.

R. I., Cranston (mail Providence)—State, Dr. F. J. Farnell, P. Welfare Comn., State House, Providence, sketches by C. E. Blais, Box 7, Howard, 4 story, 55x210 ft., brick, stone, concrete medical and surgical hospital. $450,000.

R. I., Lafayette—State, P. Welfare Comn., State House, Providence, plans 2 story, basement, brick hospital, concrete found., at Exeter School for Feeble-Minded, $125,000. C. E. Blais, Howard, state engr. Noted Sept. 7.

Tex., Hamilton—City, C. B. James, mayor, filed application with P.W.A. Bd. for constructing, equipping municipal light plant. $105,239. W. E. Collins, Hamilton, engr.

W. Va., Bramwell — Bd. Educ. plans high school. $100,000 or more. Architect not appointed.

Wis., Union Grove—State Bd. Control, A. W. Bayley, secy., Capitol, Madison, plans by A. Peabody, Madison, 2 story, 40x100 ft., brick, steel inmate building, $155,400; constructing refectory, laundry and kitchens, $200,000, at State Training School.

Wis., Wausau—Bd. Educ., J. H. Kolter, pres., plans by Oppenhemer & Obel, Wausau, (1st unit) 3 story, basement, 65x208 ft., brick, tile, stone high school, and 74x100 ft. gymnasium. Will apply for Federal aid. Noted Sept. 14.

Alaska, Ketchikan—City plans power plant and telephone system. Burns & McDonnell Eng. Co., 107 West Linwood Blvd., Kansas City, Mo., engrs.

†T. H., Pearl Harbor—Yards & Docks, Navy Dpt., Wash., D. C., rejected bids extending storehouse at Fleet Air Base, Spec. 7085. Will readvertise.

BIDS ASKED

†Ga., Fort Benning—Jan. 4, by Con. Q.M., stables. $100,000.

†Ga., Fort Benning—Jan. 5, by Con. Q.M., guard house. $55,000.

†Ga., Fort Benning—Jan. 15, by Con. Q.M., print shop. $30,000.

Ind., Aurora—Jan. 5, by School Comrs., high school building. McGuire & Shook, 1401 Fletcher Trust Bldg., Indianapolis, archts. Noted Oct. 26.

†Md., Baltimore—Jan. 4, by Treas. Dpt. at office Sup. Archt., Wash., D. C., equipment for main building and power house, garage and laundry building at U. S. Marine Hospital.

†Md., Fort George G. Meade—Jan. 3, by Con. Q.M., fire station and guard house.

†Mass., Northampton—Jan. 23, by Vet. Bur., Arlington Bldg., Wash., D. C., stoker equipment, boiler settings at Veterans Hospital.

Minn., Breckenridge—Jan. 4, by Bd. Educ., 2 story, basement, 163x212 ft., rein.-con., brick school. N. W. Fisher, 201 St. Mary's Bldg., St. Cloud, archt. Noted Nov. 16.

New York—Jan. 26, by Superintendent P. Wks., State Office Bldg., Albany, constructing Pump House 3, incl. heating, sanitary and electrical work, on Grand Central Parkway and Union Turnpike, Long Island.

N. Y., Beacon—Jan. 25, by Commissioner Dpt. Correction, State Office Bldg., Albany, accommodations for tubercular inmates, employees accommodations, storehouse, machine shed, work shop and garage, propagating house and garage, service connections, Matteawan State Hospital.

N. Y., Elmira—Jan. 18 (extended date), by State Commissioner Correction, State Office Bldg., Albany, cell block F, and extending south wall, and service connections, Elmira Reformatory. Noted Nov. 30.

N. Y., Kings Park—Jan. 10 (extended date), by Dpt. Mental Hygiene, State Office Bldg., Albany, bakery, storehouse and refrigeration plant, service connections at Kings Park State Hospital. Noted Nov. 30.

N. Y., Napanoch—Jan. 25, by Commissioner Dpt. Correction, State Office Bldg., Albany, altering administration section Main Building, cannery and service connections, Institute for Male Defectives; also miscellaneous additional work.

N. Y., Ossining—Jan. 18, by Dpt. Correction, State Office Bldg., Albany, heating work and service connections at Sing Sing Prison.

N. Y., Ossining—Jan. 25, by Commissioner Correction, State Office Bldg., Albany, library and school, and footbridge, incl. heating, sanitary and electrical work at Sing Sing Prison.

N. Y., Pine Aire Station—Jan. 10, by Dpt. Mental Hygiene, State Office Bldg., Albany, married employees building, medical and nonmedical staff building, infirmary building, single employees building, and service connections, Pilgrim State Hospital.

N. Y., Pine Aire—Jan. 17, by Dpt. Mental Hygiene, State Office Bldg., Albany, miscellaneous work, Pilgrim State Hospital.

N. Y., Saratoga Springs—Jan. 23, by Saratoga Springs Authority, 15 Spring St., constructing gymnasium group buildings.

N. Y., Wassaic—Jan. 24, by Dpt. Mental Hygiene, State Office Bldg., Albany, refrigeration work at medical and surgical building 58, Wassaic State School.

Okla., Stillwater—Jan. 4, by Bd. Public Affairs, Capitol, Oklahoma City, 2 story, basement, 60x170x170 ft., brick, steel, dormitory, Campus, Agricultural and mechanical College. $450,000. Layton, Hicks & Forsythe, Braniff Bldg., Oklahoma City, archts. Noted Oct. 6.

CONTRACTS AWARDED

†Calif., Los Angeles—Treas. Dpt. at office Sup. Archt., Wash., D. C., constructing quarantine station, to C. Montague, 1144 South Grand Ave., $65,600.

†Calif., San Diego—Yards & Docks, Navy Dpt., Wash., D. C., barracks at Naval Fuel Depot, Spec. 7534, to L. F. Dow Co., 1243 25th St., Santa Monica, $27,000 (150 days).

†Mass., Cambridge—J. Bowen Co., general contractors, 129 Newbury St., heating and ventilating for 2 story, basement post office, to Power Heating & Ventilating Co., Inc., 263 Harrison St., Boston, for Treas. Dpt. at office Sup. Archt. Noted Nov. 16, under "Contracts Awarded."

†Mass., Cambridge — J. Bowen Co., general contractors, 129 Newbury St., Boston, plumbing for U. S. Post Office, to J. S. Cassedy, Inc., 133 Austin St., Cambridge, for Treas. Dpt. at office Sup. Archt., Wash., D. C. Noted Nov. 16, under "Contracts Awarded."

Mass., East Boston (sta. Boston)—City of Boston, Dpt. School Buildings, W. W. Drummey, constr. supt., 11 Beacon St., Boston, 2 story, basement, 60x160 ft., brick addition to Joseph H. Barnes School, concrete found., to John Bowen Co., Inc., 129 Newbury St., Boston, $248,700. Bids Dec. 13, awarded Dec. 16.

Mo., Kansas City—Jackson Co., interior wood work for court house, to Helmus Mfg. Co., 6th and Buffalo Sts., $108,603. Noted Jan. 22, under "Contracts Awarded."

†N. Y., Long Beach—U. S. Coast Guard, Wash., D. C., constructing Coast Guard station, to Centaur Constr. Co., 154 Bleecker St., New York, $19,400.

†N. Y., New York—Treas. Dpt. at office Sup. Archt., Wash., D. C., elevator plant in annex, to Otis Elevator Co., 810 18th St. N.W., Wash., D. C., $560,612.

†Pa., Phila. — Yards & Docks, Navy Dpt., Wash., D. C., Air Conditioning Building 7, Navy Yard, Spec. 7369, to Carrier Eng. Co., 12 South 12th St., $8,995 (45 days).

Tenn., Nashville—Bd. P. Wks., homes for aged white and colored folks, to Foster & Creighton, American Natl. Bank Bldg., $205,000. Bids Dec. 12. Noted Dec. 7.

†Va., Fort Myer—Con. Q.M., garage addition, to W. E. Mooney, 2539 Pennsylvania Ave., Wash., D. C., $5,752. Bids Dec. 11. Noted Dec. 5.

†Wash., Fort Lewis — Con. Q.M., 1 story, 102x204 ft., brick drill hall, wood pile found., to H. Wright, 2210 2nd Ave., Seattle, $70,315. Bids Dec. 5, awarded Dec. 15.

†Hawaii—Yards & Docks, Navy Dpt., Wash., D. C., gate houses and hose house, etc., Spec. 7055, and magazine, melting facilities and roads, Spec. 7257, at Naval Ammunition Depot, Oahu, to Young Eng. Corp. Ltd., Honolulu, $34,300 and $15,200 respectively. Bids Nov. 29. Noted Oct. 26.

COMMERCIAL BUILDINGS

PROPOSED WORK

Calif., Grass Valley—Legion Memorial Hospital, plans by J. C. Peterson, 826 26th St., Sacramento, 2 story, basement, 42x212 ft., brick, steel hospital, X-ray equipment, steam heating plant.

Conn., New Haven — New Haven Business Group, H. G. Falsey, City Building Dpt., New Haven, plans made by Jacob Weinstein Associates, Metropolitan Bldg., 3 story, brick, steel apartments, Forbes Ave., Fulton and Chamberlain Sts., $850,000. Awaiting Federal action.

Mass., Lawrence—Parish of Sacred Heart, 3 Hawley St., soon takes bids superstructure 2 story, basement, 86x172 ft., brick church, South Bway. and Groton St. To exceed $150,000. J. G. Morissette, 575A Essex St., archt. Foundation completion. Noted Feb. 9.

N. Y., Brooklyn—Abingdon Amusement Co., 1540 Bway., New York, bids after Feb. 1, general contract altering theater, heating, refrigeration, air conditioning, roof garden, etc., Eastern Parkway and Nostrand Ave. $60,000 or more. T. W. Lamb, 701 7th Ave., New York, archt.

N. Y., Brooklyn—Roslyn Realty Corp., 2161 81st St., plans by Meyer & Resnick, 150 East 41st St., New York, 6 story, 84x204 ft., brick apartment, Avenue P. and 10th St. $175,000.

N. Y., Brooklyn—J. Stern, 1971 84th St., plans by I. Kallich, 375 Fulton St., 1 story, 50x106 ft., brick, steel theatre, incl. air conditioning and other equipment, McDonald Ave. and Avenue O. To exceed $105,000.

N. Y., Garden City—Wickham Housing Corp., T. Wickham, pres., plans by Pruit & Brown, Garden City, group 80 houses. Applied for $675,000 loan under P.W.A.

N. Y., Massapequa—Harmon National Real Estate Corp., 140 Nassau St., New York, plans 500 beach cottages, Biltmore Beach Colony. To exceed $150,000.

N. Y., Massapequa—Roman Beeber Inc., 134 West 32nd St., New York, plans group dwellings and apartment house, on 300 lot site acquired near Massapequa State Park. To exceed $100,000.

N. Y., New York—First and 52nd Street Corp., 220 Bway., plans by Francisco & Jacobus, 511 5th Ave., altering five 5 story, store and apartment buildings, incl. heating and sanitary work, 941 1st Ave. To exceed $70,000.

N. Y., New York—L. B. Lipman, 211 West 145th St., lessee, plans altering ten 6 story, 250x400 ft., brick apartments, incl. heating and plumbing, 107 West 135th St., for St. Philips Protestant Episcopal Church, 215 West 133rd St., owner. To exceed $70,000.

N. Y., New York—M. J. Martin & Son, 188 West 230th St., plans by B. F. Driesler, 163 Remsen St., Brooklyn, group 2 story, 18x47 ft. dwellings with garages, Giles Pl. and Independence St. To exceed $130,000.

S. C., Clemson College—Clemson College plans application for P.W.A. loan to finance construction textile arts buildings, laboratories, etc. $280,000.

BIDS ASKED

N. Y., Brooklyn—See "Contracts Awarded"

N. Y., New York—See "Contracts Awarded."

Pa., Phila.—Jan. 2 (extended date), by W. H. Lee, archt., 1505 Race Sts., Sullivan Memorial Library building, Park Ave. and Berks St., for Temple University, Broad St. and Mongomery Ave. $560,000. Noted Dec. 14.

CONTRACTS AWARDED

Ill., Chicago—Marshall Field & Co., State and Washington Sts., furnishing and installing 20 electric type wide escalators, and altering from basement to 9th floor to Westinghouse Electric Elevator Co., 1500 North Branch St., Chicago. Est. $500,000. Awarded Dec. 15.

Mass., Somerville—Winter Hill Baptist Church Society, G. N. Mott, pastor, Somerville, general contract, incl. electrical work and plumbing, 3 story, basement, 81x91 ft. brick, granite, stone church, concrete found., 312 School St., to C. C. Fulton & Son, 8 Francis St., Milton; heating and ventilating, to J. G. LaMotte & Son, Inc., 143 Federal St., Boston. Woodbury & Stuart, 581 Boylston St., Boston, archt.

N. Y., Brooklyn—Foxton Realty Co., 16 Court St., 6 story apartment, Bay 26th St. and Benson Ave., separate contracts, $130,000 or more. Owner now taking bids. Kavy & Kavovitt, 16 Court St., archts.

Okla., Oklahoma City—Atchison, Topeka & Santa Fe R.R. Co., G. W. Harris, ch. engr., 80 East Jackson Blvd., Chicago, Ill., 2 story, basement, 146x160 ft., brick, steel, passenger station to F. M. Spencer & Sons, Topeka, Kan., $460,000. Bids Dec. 11. Noted Dec. 5.

†*Federal Government.*

INDUSTRIAL BUILDINGS

PROPOSED WORK

Calif., Calpella—WINERY—S. Fusco, plans winery, approximately 1 m.g. storage, $35,000. Architect not appointed.

Calif., Half Moon Bay—CANNERY—Group of Half Moon Bay residents, incl. D. Dianda, P. Nerli, H. Daneri, et al., plan vegetable cannery. To exceed $50,000 with equipment. Architect not appointed.

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Ky., Athertonville—DISTILLERY—Cummins Distilling Co., Atherton, plans distillery. To exceed $28,500. Ford, Bacon & Davis, 39 Bway., New York, engrs. Noted Sept. 14.

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Me., Lewiston—MARKET—J. H. Stetson, Lewiston, plans market, incl. refrigeration, Lisbon St. $35,000 or more. Architect not appointed. L. Abramson, Lewiston, lessee.

Md., Baltimore—STORAGE, etc.—Benjamin Green & Co., 782 West Pratt St., plans repairing storage and distribution plant for foodstuffs, recently damaged by fire. $40,000 or more.

Mass., Fall River—MILL—Arkwright Corp. and Midland Printing Co., Fall River, and c/o United Merchants & Manufacturers, Inc., 271 Church St., New York, plans altering, constructing extensions, equipment, etc., to former Davis Mill. $28,000 or more. Maturity indefinite. Architect not appointed.

Mass., Lynn—GARAGE—E. E. Whitten & Sons, 40 Central Ave., sketches by C. L. Betton, 31 Exchange St., 1 story, brick addition, concrete found., Oxford St. and Central Ave. To exceed $28,500.

Mass., New Bedford—BAKERY, etc.—My Bread Baking Co., J. P. Duchaine, supt., 229 Coffin Ave., bids in January, 2 story, brick, mill, bakery, garage and office. $60,000. Private plans. Noted Nov. 9.

Mass., Sterling — DISTILLERY — Distilled Liquors Corp., 265 Greenwich St., New York, plans distillery additions and extensions. To exceed $50,000.

Mass., Worcester — BOTTLING PLANT — Bowler Brewing Co., 81 Lafayette St., J. A. Donahue, plans by J. R. Worcester & Co., 70 Milk St., Boston, brick, steel, Lafayette St. $50,000.

Mich., Carleton—PLANT—Dunham Moore Co., Dequindre St., Detroit, plans altering manufacturing plant and equipment. $30,000 or more.

Mich., Detroit — SERVICE — G. Holzbaugh, Inc., 3845 Fort St., plans by Pollmar, Ropes & Lundy, 2539 Woodward Ave., 2 story, 75x175 ft., brick, steel, rein.-con., stone, automobile service building, West Grand Blvd. $40,000.

Mich., Mt. Clemens — WAREHOUSE — J. Davidson plans repairing sugar warehouse damaged by fire. To exceed $45,000. North Eastern Sugar Co., Mt. Clemens, lessee.

Miss., Meridian — FACTORY — Phillips-Jones Corp., New York, manufacturers of Van Heusen men's garments, also c/o Chamber of Commerce, Meridian, plans 2 story, 90,000 sq.ft. floor space, factory. $90,000. Architect not appointed.

Mont., Shelby—OIL and GAS DEVELOPMENTS—Producers Development Syndicate, c/o G. G. Howard, Shelby, plans oil and gas development. To exceed $50,000. Private plans.

Neb., Gibson — GRAIN ELEVATOR — Nebraska-Iowa Grain Corp., plans repairing and extending grain elevator. $50,000 or more. Architect not appointed.

N. Y., Buffalo — SERVICE STATION and REPAIR GARAGE—Brost Chevrolet, Inc., Main St., plans service station and repair garage, Main St. $30,000 or more. Architect not appointed.

N. Y., Brooklyn—FACTORY—R. Karron, 810 Pennsylvania Ave., plans by Chester Architectural Corp., 26 Court St., altering 1½ story, brick, Pennsylvania Ave. and Linden Blvd. $30,000 or more with equipment.

N. Y., Brooklyn—BREWERY, WAREHOUSE, etc. — Kings Brewery, Inc., Pulaski St. and Throop Ave., plans by Shampan & Shampan, 26 Court St., altering 4 story brewery, warehouse, and office, Pulaski St. and Throop Ave. Est. about $30,000.

N. Y., Brooklyn — SERVICE REPAIR and GASOLINE STATION—Rubel Corp., 967 Fulton St., bids after Mar. 1, 1 story, service repair, gasoline station and garage, East New York and Utica Aves. To exceed $28,500. Cohn Bros., 191 Joralemon St., archt. Noted Dec. 14.

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N. Y., Far Rockaway — STORAGE, etc. — Nameoke Realty Co. 1031 Central Ave., Far Rockaway, plans altering 3 story, storage and department store and constructing 2 story, 100x100 ft. addition, Central Ave. and White St. To exceed $50,000.

N. Y., Mount Kisco—DISTILLERY—Distilled Liquors Corp., 265 Greenwich St., New York, plans distillery addition and extensions. To exceed $50,000.

N. Y., New York—PLANT—Corporation, c/o J. Froehlich, 1041 Leggett Ave., plans altering 5 story piano factory into store fixtures manufacturing plant, Barry St. and Leggett Ave. To exceed $28,000 with equipment. Private plans.

N. Y., New York—MILK DEPOT—Sheffield Farms, 524 West 57th St., plans by R. G. Zetsche, Peoples Bank Bldg., White Plains, altering 5 story milk depot, Webster Ave. and 166th St. To exceed $35,000 with equipment.

N. Y., Rheims—WINERY, STORAGE, etc.—Pleasant Valley Wine Co., c/o E. H. Jaycox, Hammondsport, plans winery and storage. Company plans financing through stock issue not to exceed $1,125,000, part of funds to be used for construction and expansion of facilities.

N. H., Marlboro—MANUFACTURING—Whitney Bros. Co., plans rebuilding manufacturing plant destroyed by fire. To exceed $28,500. Private plans.

O., Lancaster—FACTORY—Hocking Glass Co. plans new 3 story, basement, brick, steel, concrete factory unit, 9,000 sq.ft. floor space. $100,000. Private plans.

O., Martins Ferry—DISTRIBUTION PLANT, etc.—Belmont Brewing Co., Martins Ferry or c/o Distillers & Brewers, Inc., 21 West St., New York, plans distribution and storage. $85,000.

O., Toledo—PLANT—Home Packing Co., Union Stock Yards, plans addition to plant. $40,000.

Pa., Jenkintown—DISTRIBUTION, STORAGE and STORE—W. C. Fleck & Bros., plan distribution, storage and hardware store, Old York Rd. $100,000. Architect not appointed.

Pa., South Towanda—GRAIN MILL, etc.—Hagerman Milling Co., plans grain mill and storage. $40,000 or more. Maturity indefinite. Architect not appointed.

Pa., West Brownsville—STORAGE PLANT—Atlantic Refining Co., Chamber of Commerce Bldg., Pittsburgh, plans bulk oil storage plant addition, $40,000.

S. C., Anderson—STORAGE—McGee & Bowlan Co. plans altering and repairing grocery and food storage. $45,000. Architect not appointed.

S. C., Columbia—HYDRO-ELECTRIC PLANT—Columbia Railway & Navigation Co., Columbia, filed application with P.W.A. for loan to finance construction power plant and 2 large dams on Santee-Cooper Rivers. $34,000,000.

Tex., Burnet—ICHTHYOL PLANT—J. Odd-Hamilton, et al, c/o Clements Apartments, plans ichthyol plant outside north end city limits. $50,000. Engineer, c/o owners, engr.

Tex., Pledger—REFINERY—Danciger Oil Co. plans refinery. $85,000.

Vermont—COLD STORAGE PLANT—Windham County Fruit Growers Assn., Brattleboro, J. W. Collins, chn. of executive com., Westminster, sketches 1 story, 64x100x26 ft. brick or cement block cold storage plant, concrete found. $40,000. Private plans.

Wash., Seattle—BREWERY—Rainier Brewing Co., L. Hemrich, pres., G. Wolff, sales mgr., plans rehabilitation of the Georgetown Brewery, later bottling works will be installed. Total $500,000.

W. Va., North Warward—BULK OIL PLANT—Sun Oil Co., 1608 Walnut St., Phila., Pa., plans bulk oil plant. $40,000.

Wis., Ashland—PLANT—Pioneer Creamery Co., F. Necke, pres., plans by E. F. Klinger, Amery, 2 story, 45x72 ft., brick, steel, creamery and dairy plant, plain found.

Wis., New Lisbon — PLANT — Christmann Brewing Co. plans brick bottling plant and storage building, plain found. $40,000. Architect not appointed.

B. C., Vancouver—CANNERY—Thompson Packing Co., Angus Dr., plans 1 story, 120x172 ft. cannery, 2 story, 90x220 ft. storage building, 30x50 ft. boiler house, 2 story, 90x140 ft. reduction plant and wharf on same size.

B. C., Victoria—PLANING MILL—Canadian Western Woodworkers Ltd., Garbally Rd., plans rebuilding 1 story, 75x125 ft. planing mill, destroyed by fire. Interested in prices complete equipment.

Ont., London—SAW MILL—G. H. Belton Lumber Co. Ltd., Rectory St., plans rebuilding saw mill, destroyed by fire. $50,000 loss.

Ont., London—DAIRY—Silverwoods, Ltd., Bathurst St., A. E. Silverwood, pres. and genl. mgr., plans by Watt & Blackwell, 286 Dundas St., 3 story, 58x116 ft., brick dairy addition. $50,000.

BIDS ASKED

Mo., Joplin—HEATING PLANT—See "Contracts Awarded."

N. Y., Brooklyn — SHOP — See "Contracts Awarded."

N. Y., Brooklyn—WAREHOUSE—New York Distillers Corp., Van Brunt and Kane Sts., taking bids on separate contracts reconditioning distillery, incl. storage tanks, etc., Van Brunt and Kane Sts. To exceed $30,000. Architect, c/o R. N. Thayer, 124 East 64th St., New York. Noted Dec. 14.

N. Y., Brooklyn—FACTORY—S. Pizzutiello & Co., 1219 45th St., taking bids on general and separate contracts factory, 38th St. and East 21th Ave. H. Korn, 29 West 34th St., New York, archt. Noted Dec. 21.

Ont., Timmins—WOODEN TANKS—Gold Belt Brewery Co., Ltd., Timmins, bids about Feb. 1, installing 4 wood tanks. $4,000.

CONTRACTS AWARDED

Calif., Oakland—YEAST PLANT—Standard Brands, Inc., 245 11th St., San Francisco, and 595 Madison Ave., New York, yeast plant, 98th and San Leandro Sts., to Barrett & Hilp, 918 Harrison Ave., San Francisco. Est. about $1,000,000. Noted Apr. 6.

Ill., Chicago—STORAGE BATTERY PLANT—Arrow Mill Co., 4420 West 26th St., storage battery parts plant, to F. J. Miller, 8240 Loomis St. Est. $30,000 or more.

Ill., Pittsfield—SHOE FACTORY—Hagerman & Harshman, general contractor, Sullivan, plumbing for 1 story, 112x147 ft., shoe factory addition, to J. A. Lynch, Plumbing Co., 1627 Chestnut St., St. Louis, Mo., for Brown Shoe Co., 1600 Washington Ave., St. Louis. Est. $50,000. Noted Dec. 21 under "Contracts Awarded."

La., Lake Charles—CHEMICAL PLANT—Stone & Webster, 90 Broad St., New York, general contractors, dredging 3 mi. channel from salt works at West Hackberry to nearby channel, to W. T. Burton, Sulphur, $25,000. Above in connection with chemical plant construction, for Mathieson Alkali Wks., 250 Park Ave., New York, plans 20 mi. pipe line in connection with same. Noted Dec. 21, under "Contracts Awarded."

Mo., Joplin — HEATING PLANT — Joplin Steam Heating Co., Joplin, extending central heating plant and extending heating mains, separate contracts and day labor. $150,000.

N. J., Flemington—WAREHOUSE and BOTTLING PLANT—Distilled Liquors Corp., 265 Greenwich St., New York, bonded warehouse and bottling plant, to Thompson Starrett Co., 250 Park Ave., New York. To exceed $50,000 each.

N. Y., Brooklyn—SHOP and GARAGE—S. Friedman, Eagle and Provost Sts., shop and garage, to Riger Building Corp., 145 West 41st St., New York. Est. exceeds $28,500. Noted Dec. 14.

N. Y., Brooklyn—SHOP—Spitz, Inc., Kent Ave. and 4th St., altering 3 story, factory, and constructing top addition, Kent Ave. and 4th St., separate contracts. To exceed $28,000 with equipment. F. J. Wasselle, 565 Lorimer St., archt. Noted Dec. 21.

N. Y., Jamaica—GARAGE, etc.—J. J. Resencoff, 104 Fulton St., Brooklyn, 25x62 ft., 20x40 ft. and 35x50 ft. garage, service station, etc., Merrick Rd. and Sampson Ave., separate contracts now being awarded. To exceed $30,000. I. Kallich, 375 Fulton St., Brooklyn, archt. Noted Nov. 16.

N. Y., Lyons—WAREHOUSE and BOTTLING PLANT—Hildick Corp., c/o Distilled Liquors Corp., 265 Greenwich St., New York, bonded warehouse and bottling plant, to Thompson Starrett Co., 250 Park Ave., New York, $75,000 and $50,000 respectively.

Ont., London—FACTORY—Kellogg Co. of Canada, 4 story, basement, brick, addition, to Carter, Halls Aldinger, Box 66, Windsor, $100,000. Noted Nov. 30.

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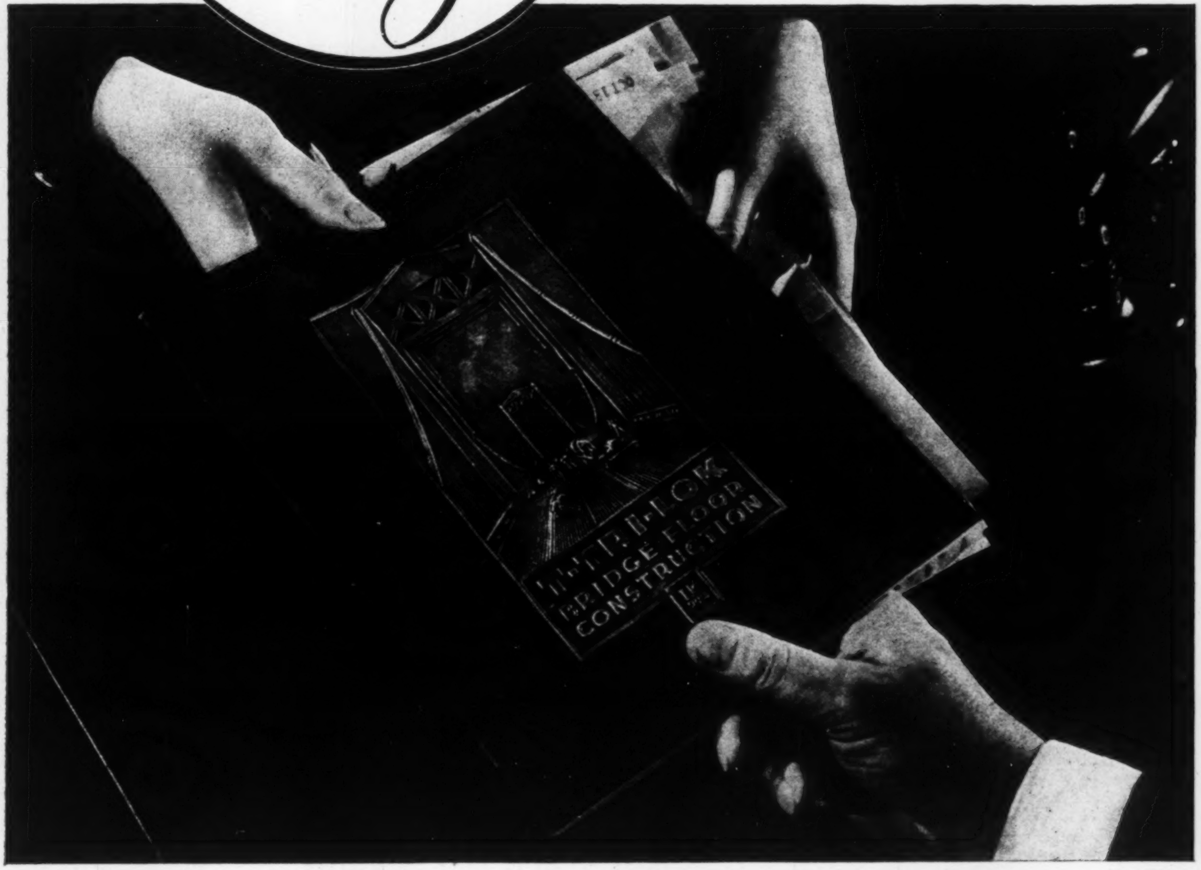

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Mich., Carleto
Dequindre St.,
turing plant an

Mich., Detroi
Inc., 3845 Fort
Lundy, 2539 W
ft., brick, steel
service building,

Mich., Mt.
Davidson plans
aged by fire. T
ern Sugar Co.,

Miss., Meridia
Corp., New York
men's garments,
Meridian, plans 2
factory. $90,000.

Mont., Shelby
MENTS—Produc
G. G. Howard,
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Neb., Gibson
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extending grain
Architect not ap

N. Y., Buffal
REPAIR GARAG
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Main St. $30,0
appointed.

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Constr. News pag

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La., Lake Charles—CHEMICAL PLANT—[illegible]

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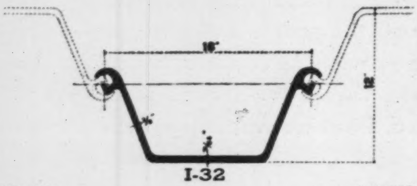

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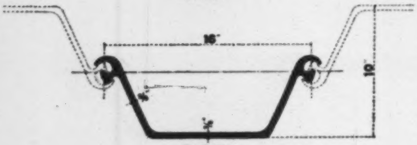

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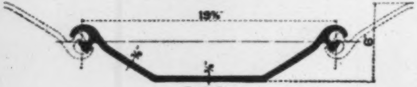

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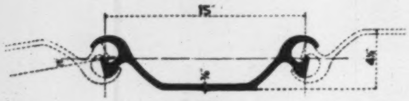

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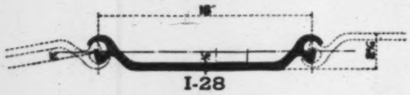
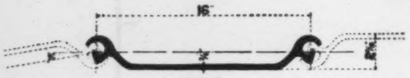
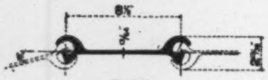


I-28



I-23



I-21

Section	I-32	I-27	I-22
Weight per foot	42.7 lbs.	36.0 lbs.	36.0 lbs.
Weight per square foot of wall	32.0 lbs.	27.0 lbs.	22.0 lbs.
Moment of inertia	87.0 in.^{4}	53.0 in.^{4}	22.4 in.^{4}
Section Modulus	20.4 in.^{3}	14.3 in.^{3}	8.8 in.^{3}
Section Modulus per lineal foot of wall	15.3 in.^{3}	10.7 in.^{3}	5.4 in.^{3}
Section Modulus per foot interlocked	24.5 in.^{3}		
Strength of interlock per lineal inch in direct tension	8,000 lbs.	8,000 lbs.	8,000 lbs.

Section	I-31	I-28	I-23	I-21
Weight per foot	38.8 lbs.	37.3 lbs.	30.7 lbs.	14.9 lbs.
Weight per square foot of wall	31.0 lbs.	28.0 lbs.	23.0 lbs.	21.0 lbs.
Moment of inertia	17.9 in.^{4}	6.0 in.^{4}	5.5 in.^{4}	1.0 in.^{4}
Section Modulus	8.1 in.^{3}	3.3 in.^{3}	3.2 in.^{3}	1.0 in.^{3}
Section Modulus per lineal foot of wall	6.5 in.^{3}	2.5 in.^{3}	2.4 in.^{3}	1.4 in.^{3}
Strength of interlock per lineal inch in direct tension	10,000 lbs.	12,000 lbs.	12,000 lbs.	8,000 lbs.

New Catalog

CATALOG
NUMBER
TWO
INLAND
STEEL SHEET PILING
PILING • BARS
STRUCTURALS
PLATES • RIVETS
SHEETS • STRIP
BILLETS • RAILS
TRACK ACCESSORIES
TIN PLATE

NRA

INLAND STEEL COMPANY
38 SOUTH DEARBORN STREET
CHICAGO • • • • ILLINOIS

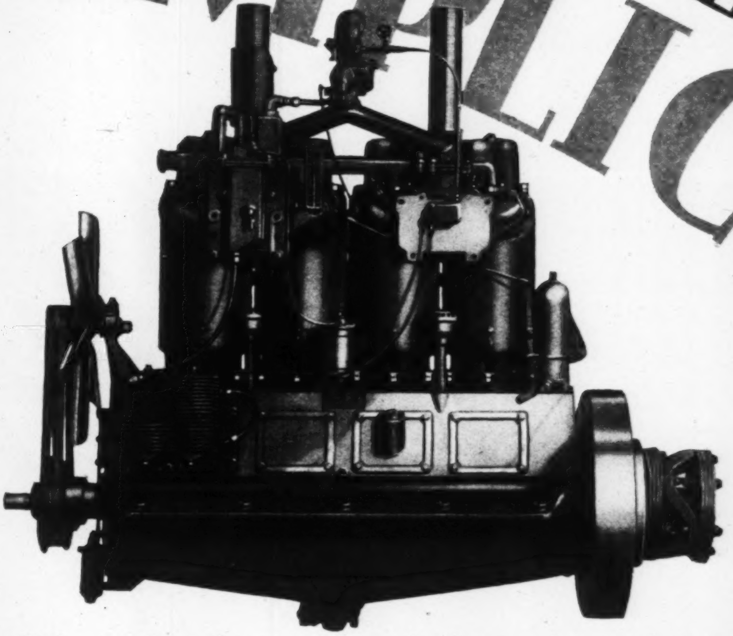
The New Inland Steel Sheet Piling Catalog No. 2 is ready for you. . . . It describes in detail all Inland Sheet Piling Sections—some new, some revised—comprising a line to meet all construction needs. . . . It includes vital information in a form handy for use in the office, in the drafting room and in the field. . . . It pictures outstanding projects constructed of Inland Sheet Piling. . . . A valuable book that each important man in your organization should have. Request the number you need. INLAND STEEL COMPANY, 38 South Dearborn Street, Chicago, Illinois.

[redacted]

AND
HE CENTRAL WEST
EEL

Rails	Track Accessories	
Bars	Rivets	Billets

AN OIL ENGINE WITH GASOLINE ENGINE SIMPLICITY



Here are all the engine advantages required to make *your* job a profitable one—simplicity of operation with low cost, dependable power!

There are no moving parts not found in a gasoline engine.

There are no injectors or fuel pumps.

It is readily understood by any gasoline engine man.

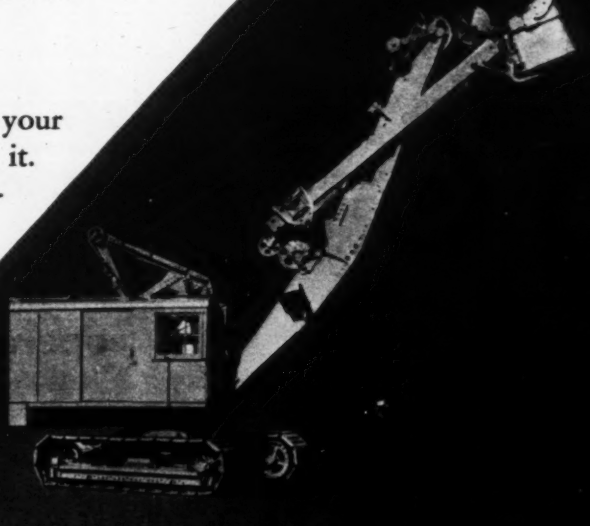
There are no destructive high pressures.

—And it burns ordinary furnace oil!

You will want to know what it will save on your job. You will want to know who is using it. You will want to know about its other advantages. Write for details.

NORTHWEST ENGINEERING CO.
The world's largest exclusive builders of gasoline, oil and electric powered shovels, cranes and draglines
1727 Steger Bldg. 28 E. Jackson Blvd.
Chicago, Illinois, U. S. A.

ENR12-28Gray

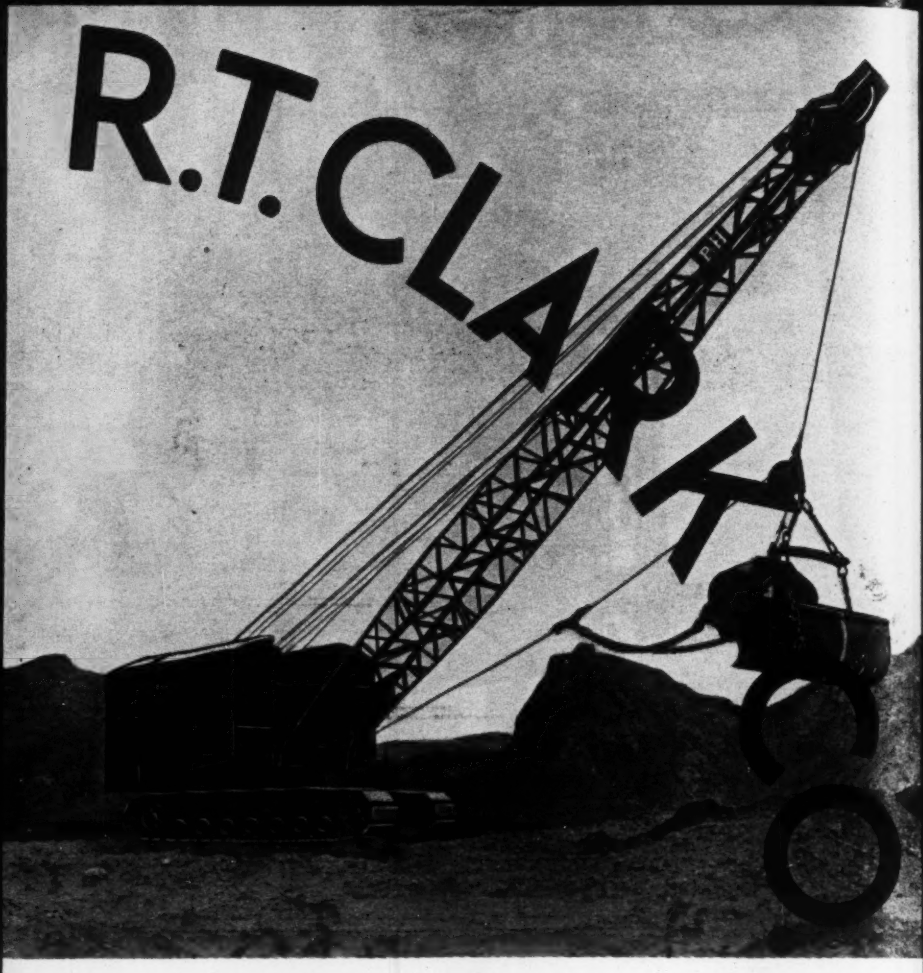


Cut YOUR FUEL COSTS with ordinary furnace oil!

NORTHW
OIL ENGI

man, oh man!

we'll say the evidence is piling up



Week after week, new P&H Excavators are going to bat on Recovery Projects! Such evidence is unescapable: when men want to be sure of low dirt-moving costs they turn to P&H with Split Second Control.

Here's Another . . . down at Natchez, Miss. now at work on a PWA levee job with a P&H Model 750-LC Dragline — operating with a 2-yd. bucket on a 45 ft. boom. And that's a rig you can't beat for making the dirt fly at low cost.

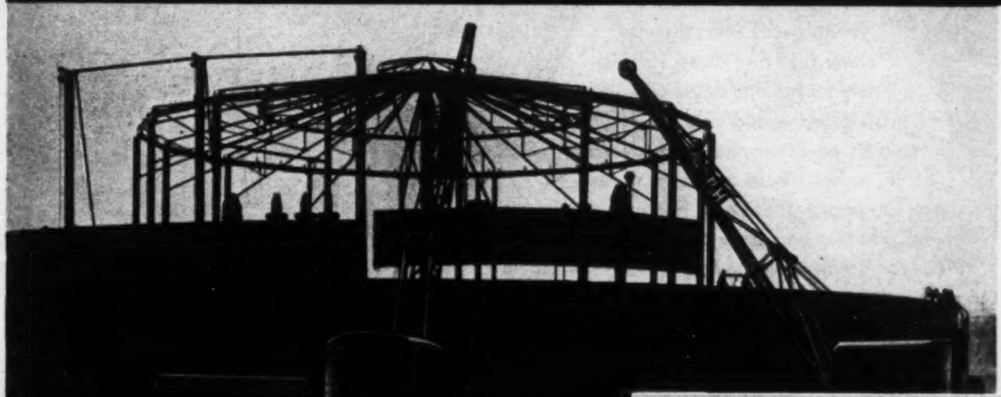
NRA
WE DO OUR PART

HARNISCHFEGER CORPORATION

4404 W. NATIONAL AVENUE Established 1884 MILWAUKEE, WISCONSI
WAREHOUSES AND SERVICE STATIONS:
HOBOKEN MEMPHIS JACKSONVILLE SEATTLE DALLAS LOS ANGELES SAN FRANCISC

World's Largest Arc Welded Tank

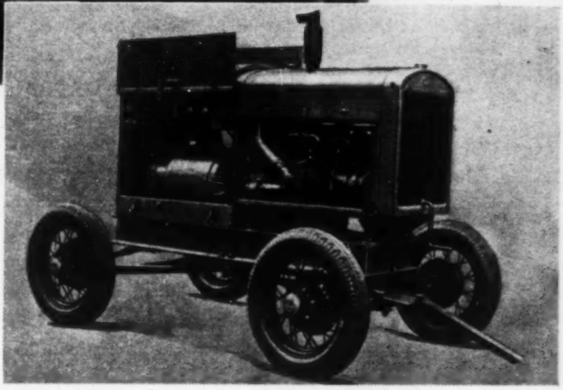
built with ten P&H-HANSEN WELDERS



This 6,000,000 gallon tank is entirely self-supporting — welded throughout. The lowest row of plates are 1-3/16 in. thick, welded to a steel plate floor. Each succeeding row is slightly thinner to allow for a good strong bead on both inside and outside. Walls are 37 feet high. P&H-Crawler Cranes set the steel.

No sir—not a rivet in this 6,000,000 gallon water tank built for the city of Milwaukee. It was a pioneering job, and one in which the contractors could take no chances with the welding apparatus.

Welders *had* to be good — quality of welds had to be high — metal had to be laid fast — and the job had to be done at a price. P&H-Hansen Arc Welders — ten of 'em — were selected for this important work. P&H-Hansens are built by an organization that has had fifty years experience in the manufacture of electrical equipment and contractors' equipment.



P&H-Hansen Gasoline Powered Arc Welders are economical in operation—fast, sturdy, dependable. You'll lay more metal with a P&H-Hansen, you'll lay it more uniformly—and for less money. There's a size and type for every need.

P&H-Hansens are rugged, simple to operate, dependable performers under all conditions. You'll find 'em on tough jobs in factory and field alike. Write today for complete data on the new line of P&H-Hansen welders for construction work.

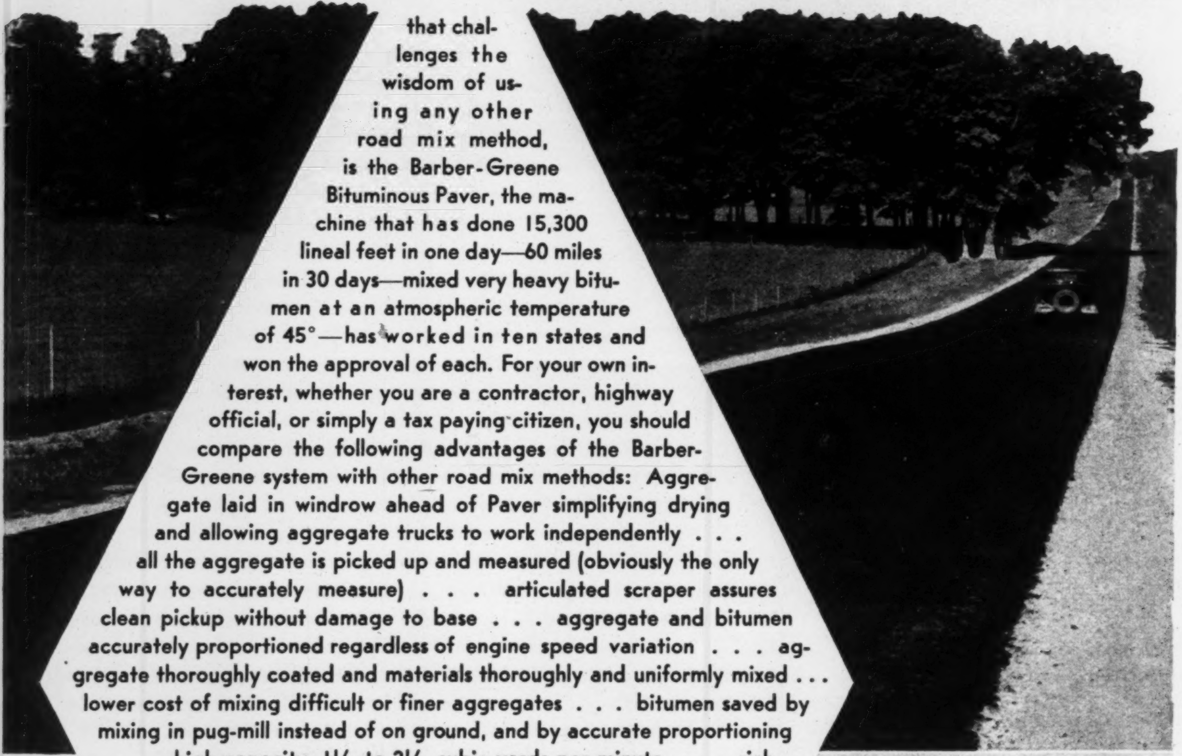
HARNISCHFEGER CORPORATION

4404 W. NATIONAL AVENUE Established 1884 MILWAUKEE, WISCONSIN

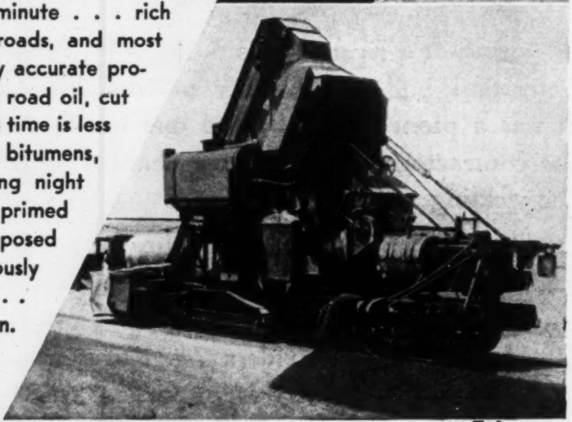
WAREHOUSES AND SERVICE STATIONS

HOBOKEN MEMPHIS JACKSONVILLE SEATTLE DALLAS LOS ANGELES SAN FRANCISCO

An Achievement



that challenges the wisdom of using any other road mix method, is the Barber-Greene Bituminous Paver, the machine that has done 15,300 lineal feet in one day—60 miles in 30 days—mixed very heavy bitumen at an atmospheric temperature of 45°—has worked in ten states and won the approval of each. For your own interest, whether you are a contractor, highway official, or simply a tax paying citizen, you should compare the following advantages of the Barber-Greene system with other road mix methods: Aggregate laid in windrow ahead of Paver simplifying drying and allowing aggregate trucks to work independently . . . all the aggregate is picked up and measured (obviously the only way to accurately measure) . . . articulated scraper assures clean pickup without damage to base . . . aggregate and bitumen accurately proportioned regardless of engine speed variation . . . aggregate thoroughly coated and materials thoroughly and uniformly mixed . . . lower cost of mixing difficult or finer aggregates . . . bitumen saved by mixing in pug-mill instead of on ground, and by accurate proportioning . . . high capacity, 1½ to 2½ cubic yards per minute . . . rich and lean spots so COMMON in bituminous roads, and most frequent cause of surface failure, eliminated by accurate proportioning and uniform mixing . . . handles road oil, cut back, emulsion, and tar . . . total handling time is less than two minutes, allowing quicker setting bitumens, and work in colder atmosphere including night work . . . all or half of road can be primed ahead . . . no partly mixed material exposed to rain . . . Paver operates continuously . . . only two operators required . . . better job co-ordination.



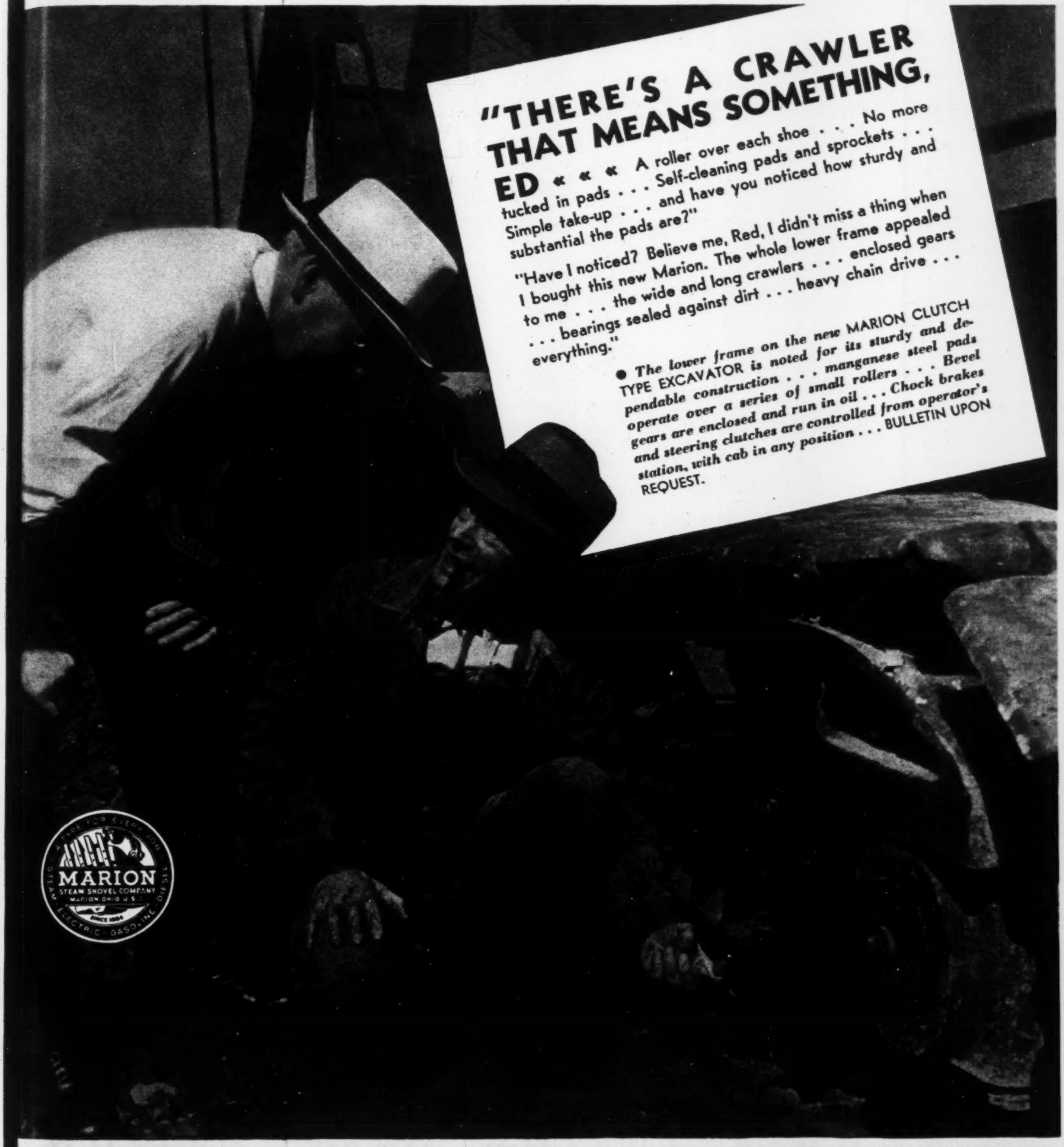
Paver available on wheels if desired, giving faster travel between jobs (10 M.P.H.) The standard B-G Paver and Finisher meet most conditions. We solicit special problems, however, as we are equipped to design and build special machines. We just completed two special Finishers for the U. S. Government for laying asphalt on Mississippi river revetment work.

BARBER GREENE

422 West Park Ave.,
Aurora, Illinois

NRA

"ED" AND "RED" TALK OVER THE NEW MARION LINE



"THERE'S A CRAWLER THAT MEANS SOMETHING, ED « « « A roller over each shoe . . . No more tucked in pads . . . Self-cleaning pads and sprockets . . . Simple take-up . . . and have you noticed how sturdy and substantial the pads are?"

"Have I noticed? Believe me, Red, I didn't miss a thing when I bought this new Marion. The whole lower frame appealed to me . . . the wide and long crawlers . . . enclosed gears . . . bearings sealed against dirt . . . heavy chain drive . . . everything."

● *The lower frame on the new* MARION CLUTCH TYPE EXCAVATOR *is noted for its sturdy and dependable construction . . . manganese steel pads operate over a series of small rollers . . . Bevel gears are enclosed and run in oil . . . Chock brakes and steering clutches are controlled from operator's station, with cab in any position . . .* BULLETIN UPON REQUEST.

MALL REVOLVING GROUP

Clutch Drive

pe 340	1 cu. yd.
pe 351	1 1/4 cu. yd.
pe 361	1 1/2 cu. yd.
pe 371	1 3/4 cu. yd.

Three Motor Drive

pe 450	1 1/4 cu. yd.
pe 460	1 1/2 cu. yd.
pe 471	1 3/4 cu. yd.

THE MARION

STEAM SHOVEL CO., MARION, OHIO, U. S. A.

Electric » Gasoline » Diesel » Steam
Gas-Electric » Diesel-Electric
Shovel » Clamshell » Dragline » Trench Shovel

INTERMEDIATE REVOLVING GROUP

Two Belt Crawler Class

Type 480	2 cu. yd.
Type 490	2 1/4 cu. yd.
Type 4101	2 1/2 cu. yd.
Type 4120	3 cu. yd.
Type 4160	4 cu. yd.

Four Belt Crawler Class

Type 5120	3 cu. yd.
Type 125	4 cu. yd.

LARGE REVOLVING GROUP

Type 5320	8 to 12 cu. yd.
Type 5480	12 to 16 cu. yd.
Type 5560	16 to 20 cu. yd.

The LANE Construction Corporation

ADDS 4 *Diesel-powered* LINNS

LINN Diesels on the Lane projects at Newton, Conn., and New Lebanon, N. Y.

3 5 6
THE LANE CONSTR CORP
LINN
LINN

— an important addition to their fleet of LINN tractors

In 1921 the Lane Construction Corporation swung to LINN payload-carrying Tractors. They have been enthusiastic LINN users ever since, operating a fleet of 16 gas-powered units.

To this fleet have just been added 4 new LINNS, powered by the proved LINN-Cummins Diesel engine. Thus Lane is taking advantage of efficient Diesel power, bringing their haulage costs, already low, to a new low level.

Contractors everywhere are swinging to this improved LINN because it combines the operating economies of Diesel-power with the many advantages exclusive with LINN. *It cuts haulage costs.* The facts are available. Ask the nearest LINN representative or write direct to headquarters at Morris.

LINN TRACTORS

LINN Products are Patented

NRA

THE LINN MANUFACTURING CORPORATION

MORRIS, NEW YORK

Represented in
Allentown, Pa.
Baltimore, Md.
Chicago, Ill.
Denver, Col.
Fairport, N. Y.
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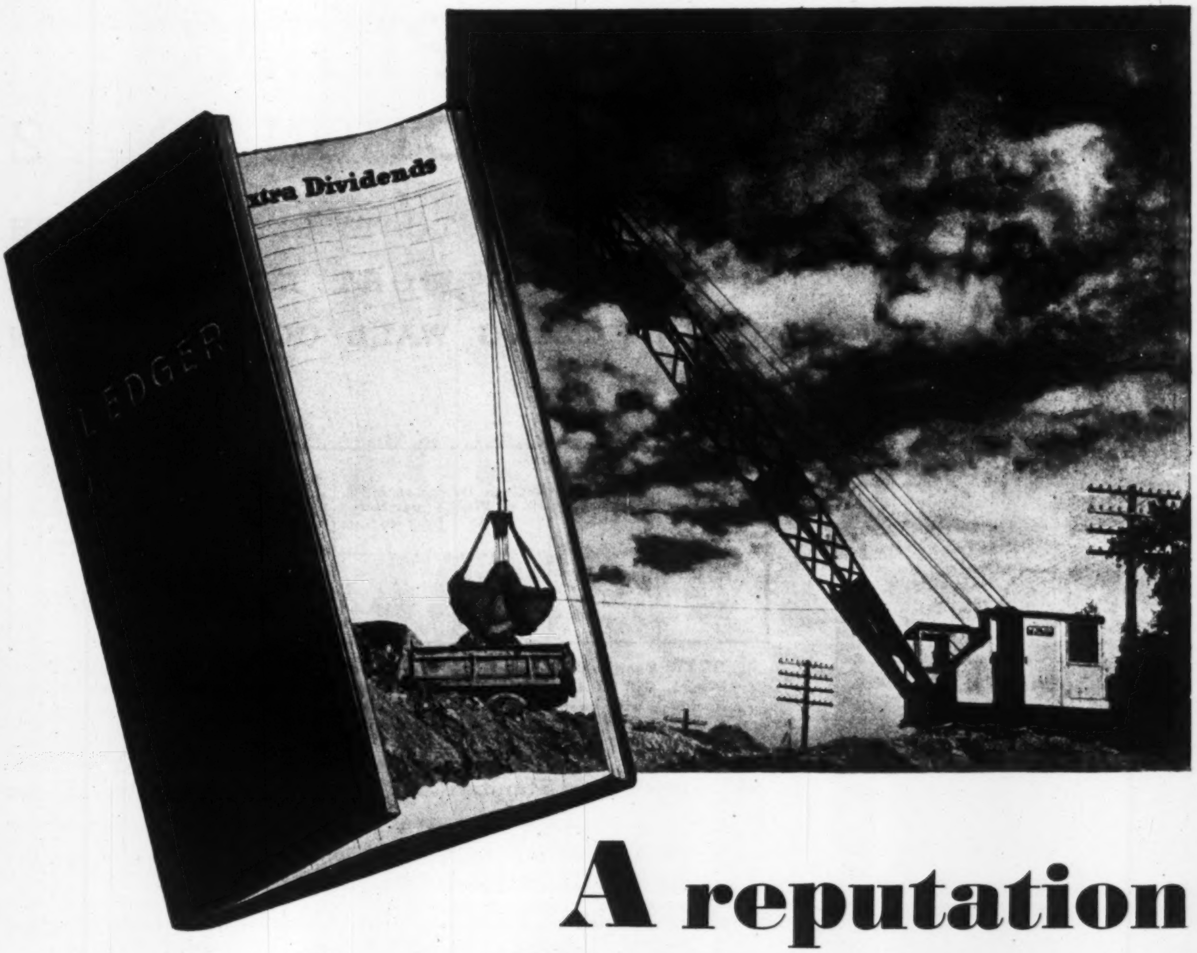
Gloversville, N. Y.
Los Angeles, Cal.
Louisville, Ky.
Miami, Fla.
Milwaukee, Wis.
Nashville, Tenn.
New Haven, Conn.
New York, N. Y.
Omaha, Nebr.
Phoenix, Ariz.
Pittsburgh, Pa.
Portland, Ore.
Roanoke, Virginia
St. Paul, Minn.
Salt Lake City, Utah
Sioux Falls, S. D.
Skowhegan, Maine
Spokane, Wash.
Youngstown, Ohio

Canadian Linn Distributors: Mussens Limited, Montreal


xtra Dividends
LEDGER

A reputation

. . . for long-life performance!

The machine that is built with the staunch dependability to give you the maximum years of profitable service, may be depreciated on your books, at a minimum life expectancy. But after it has been charged off, it can pay extra dividends by going right on moving dirt efficiently and economically as in the days of its youth. When the time comes to dispose of it, you can move it more readily, and secure a higher price, if the name it bears carries a reputation for long-life performance.

Many Bucyrus-Erie machines built twenty to thirty years ago are still in service today.

BUCYRUS-ERIE COMPANY, South Milwaukee, Wis.

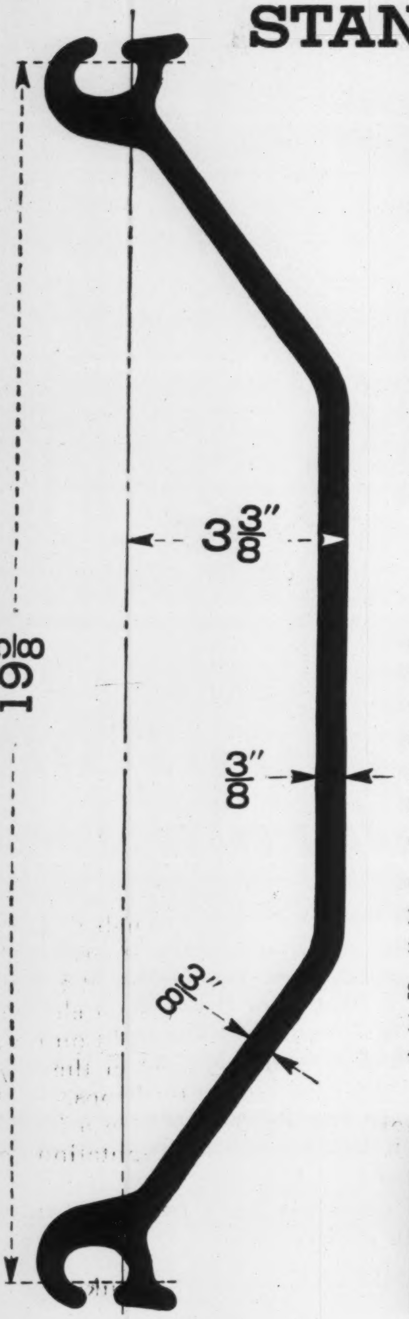
All sizes: ½- to 20-yards . . . shovels; draglines; dragshovels; skimmer scoops; cranes; clamshells; dredges; tower excavators; tunnel shovels; Bucyrus-Monighan walking draglines . . . gasoline, Diesel, electric, Gas+Air, Diesel-electric, and steam powered . . . railway cranes; spreader plows; ballast plows; Loadmaster cranes; Red Arch dragline buckets; Bucyrus-Armstrong blast hole drills, well drills, tools and drill sharpeners.

DEPENDABILITY
POWER
SPEED
UPKEEP ECONOMY
OPERATING EFFICIENCY
RESOURCES OF MANUFACTURER
LONG LIFE
EXPERIENCE OF MANUFACTURER
REPUTATION OF MANUFACTURER
BALANCED VALUE
for
LOWER COSTS

See **BUCYRUS ERIE** *before you buy!*

J & L STEEL PILING

STANDARD SECTION EDC-22



IS A GENERAL UTILITY SECTION WHICH PROVIDES UTMOST ECONOMY IN STEEL PILING WALL CONSTRUCTION

Area, Square Inches	Wt. per Ft. of Bar, Lbs.	Wt. per Sq. Ft. of Wall, Lbs.	Sec. Mod. per Bar, In.^{3}	Sec. Mod. per Linear Ft. of Wall, In.^{3}	Moment of Inertia, In.^{4}	Interlock Strength, Direct Tension Lbs. per Linear Ft.
10.59	36.0	22.0	8.8	5.4	22.4	8,000

NOTE: Section EDC-22 will interlock with J & L Steel Piling Standard Sections PC-31, DC-27, DC-32, SW-23 and SW-28. Standard Sections SW-31, SW-35 interlock with each other. (See Jones & Laughlin's engineering data note book sheet on J & L Standard Steel Piling Sections.)

J & L Steel Piling Standard Section EDC-22 is adapted for use in practically all types of steel piling construction, including cutoff walls, core walls, foundation work, cofferdams and retaining walls. Section EDC-22 offers utmost economy in that it provides adequate wall strength with minimum weight of steel per square foot of piling wall.

The Jones & Laughlin Steel Corporation maintains a special engineering staff and invites inquiries on all types of steel piling projects, which will be analyzed promptly and reported upon in detail.

Send for the **J & L** Steel Piling engineering data note book sheet. It contains latest information on **J & L** Standard Steel Piling Sections and Standard Fabricated Sections. There is no obligation.

J & L STEEL CONSTRUCTION PRODUCTS

LIGHT WEIGHT ROLLED CHANNELS — JUNIOR BEAMS
STEEL PILING — STANDARD STRUCTURAL SHAPES
BARS FOR CONCRETE REINFORCEMENT — STEEL PIPE

FABRICATED STRUCTURAL WORK including
Steel Plate Construction

J&L STEEL

JONES & LAUGHLIN STEEL CORPORATION
AMERICAN IRON AND STEEL WORKS
JONES & LAUGHLIN BUILDING, PITTSBURGH, PENNSYLVANIA
Sales Offices: Atlanta Boston Buffalo Chicago Cincinnati Cleveland Dallas Denver Detroit Erie Los Angeles Memphis Milwaukee Minneapolis New Orleans New York Philadelphia Pittsburgh St. Louis San Francisco
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LAY·SET
Preformed
Wire Rope

We pay the postage

SEND FOR THIS SAMPLE . . . . .

yours for the asking

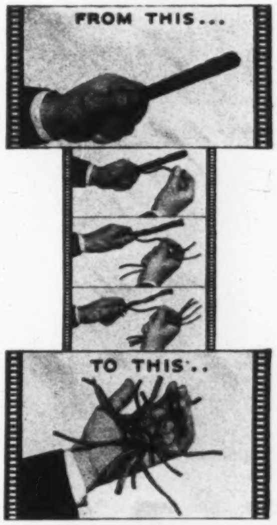
IT CAN BE WORTH THOUSANDS OF DOLLARS TO YOUR ORGANIZATION . .

EVERY individual in your organization will be intensely interested in seeing the piece of preformed wire rope shown in the photograph above. We have put it aside for *you* . . . to mail you *free*, postage prepaid. Clip the coupon below and mail today. There's no obligation.

When it arrives you'll find it one of the strangest pieces of wire rope you have ever seen. *The ends are not seized* . . . yet it retains its structure perfectly. Pass this sample around. Some one will surely try to find the "catch" in it —because they expect wire rope to explode like a clock-spring when wires and strands are released. But there isn't any "catch." In this piece of preformed wire rope all wires and strands lie in place perfectly relaxed. Some one will untwist a strand . . . then a wire. They will take the entire rope apart and assemble it again. No explosions, no twisting, no difficulty.

For years you have been *hearing* about Preformed Wire Rope. You have probably *seen* LAY-SET on several jobs. You have heard numerous reports that it lasts much longer than *non*-preformed rope. But unless you have *used* LAY-SET you may *doubt* the claims that it resists kinking, is easier to handle and splice, has perfect strand balance—and that INTERNAL STRESS (which destroys rope prematurely) has been eliminated by the preforming process in the manufacture of LAY-SET.

We want you to take this wire rope in your hands and make the test yourself. Just clip the coupon, fill in name and mail. The sample we have reserved for you will be sent postage paid and obligation free by return mail. Or write



We want YOU to make this test for yourself

Remove each strand in a section of LAY-SET Preformed Wire Rope. Remove each wire from each strand. Then reassemble. Wires and strands slide back perfectly into their original relaxed helical positions.

ENR

HAZARD WIRE ROPE COMPANY

Wilkes-Barre, Pennsylvania

New York Pittsburgh Chicago
Denver Los Angeles San Francisco
Birmingham Philadelphia
Fort Worth Tacoma

ACCO

NRA MEMBER U.S. WE DO OUR PART

TEAR ALONG THIS LINE

NO OBLIGATION

yes . . send a FREE sample *of LAY-SET Preformed Wire Rope with the understanding there is no obligation.*

We use wire rope for..

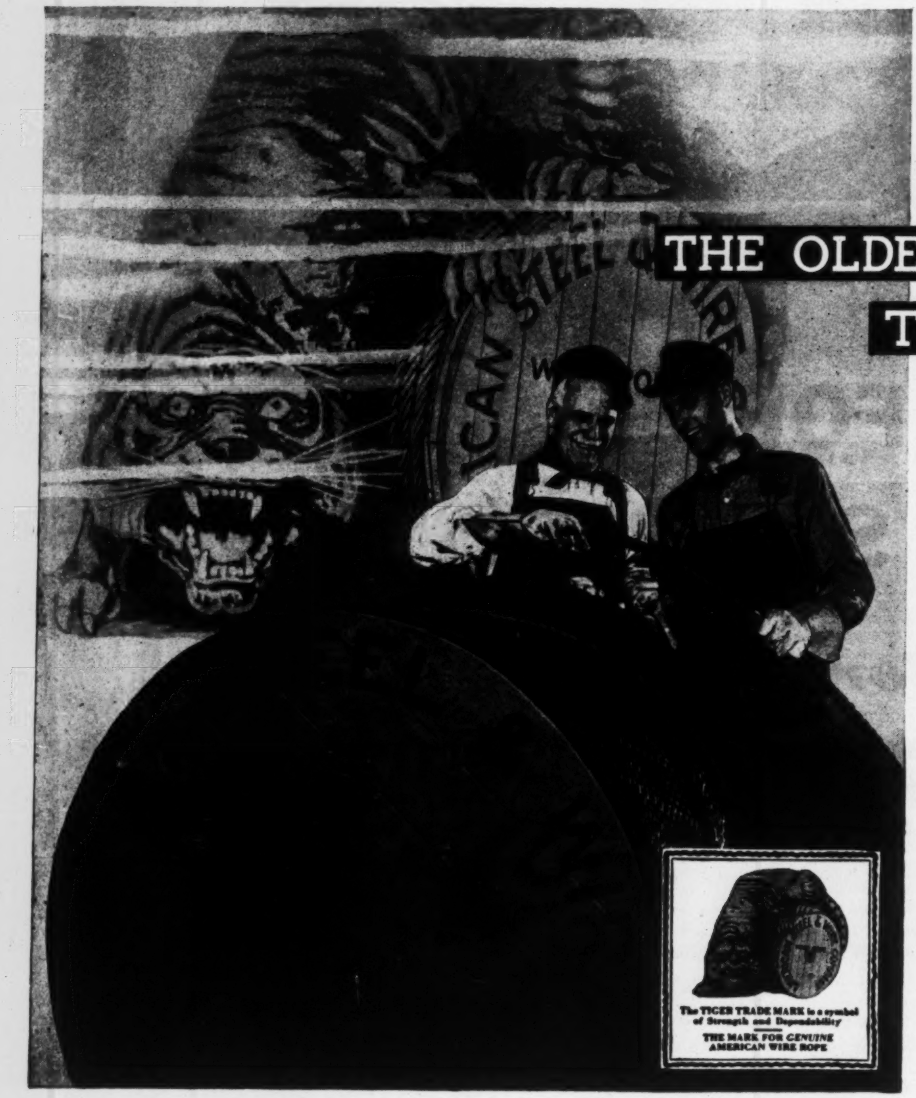
Firm Name..

Your Name..

Address..

City.......................... *State*..........................

WHAT'S BACK OF WIRE ROPE IS VITAL


AMERICAN STEEL & WIRE
The TIGER TRADE MARK is a symbol of Strength and Dependability
THE MARK FOR GENUINE AMERICAN WIRE ROPE

THE OLDEST MEMBER TELLS WHY

WHY do I insist on American Steel & Wire Company Wire Rope? "Well—I have been here a long, long time—and it has been a part of my job to get the most out of every foot of rope we purchase. In the beginning we experimented quite a bit—trying this and trying that. But—it didn't take us long to find out that one brand cost us less to use—was always uniformly dependable—and stood up better under the hardest tests we could give it. On top of that we got real service whenever we needed it—and were always certain of getting exactly the right rope for the work it had to do. Take a tip from me—whether it's here, or anywhere else, you're bound to be right if you specify American Steel & Wire Company Wire Rope."

AMERICAN
STEEL & WIRE COMPANY
WIRE ROPE

1831 MORE THAN 100 YEARS OF PROGRESS IN WIRE MAKING **1933**

AMERICAN STEEL & WIRE COMPANY

208 South LaSalle Street, Chicago
94 Grove Street, Worcester

SUBSIDIARY OF UNITED STATES STEEL CORPORATION
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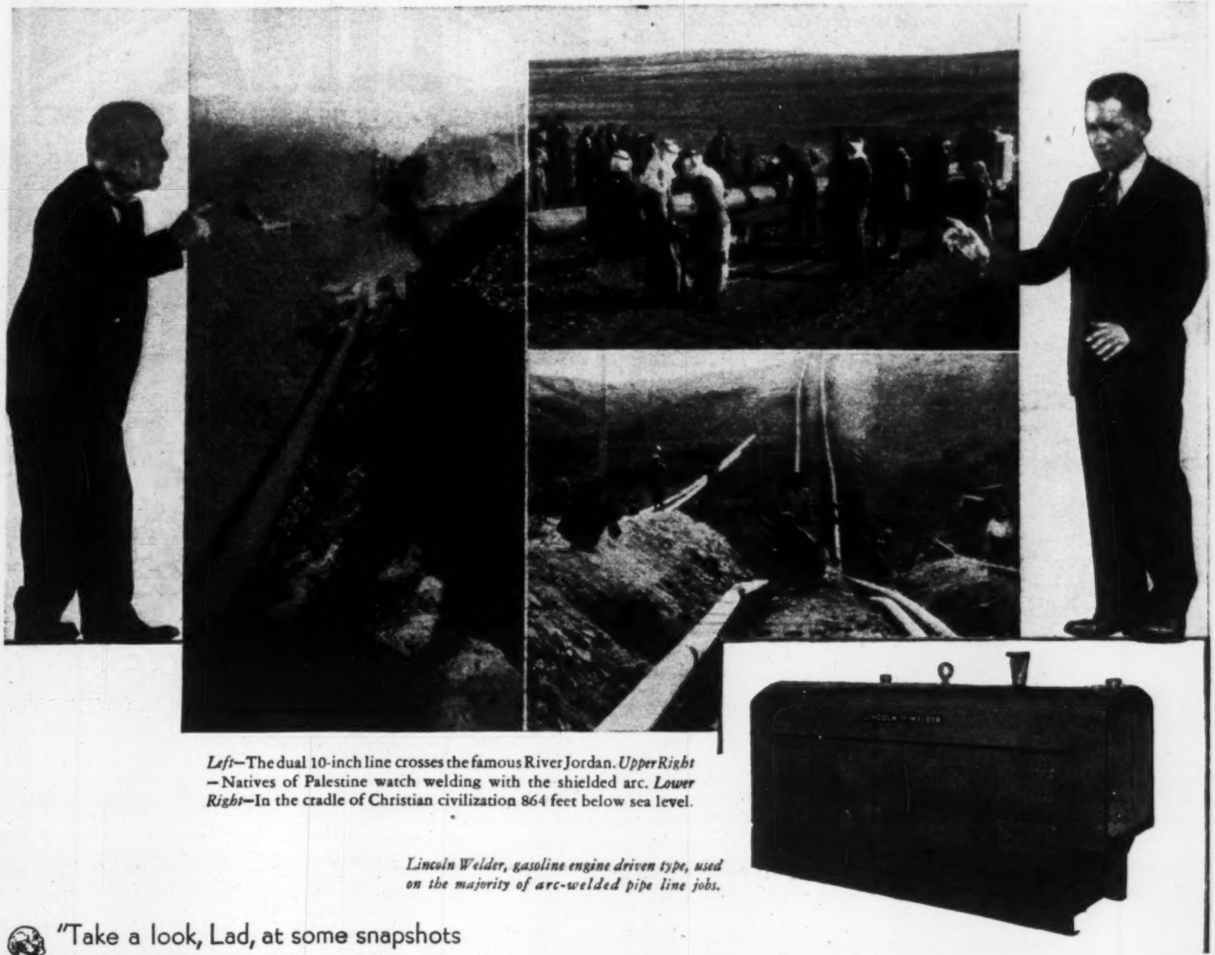
POP REPORTS TO LAD ON THE IRAQ PIPE LINE...



Left—The dual 10-inch line crosses the famous River Jordan. *Upper Right*—Natives of Palestine watch welding with the shielded arc. *Lower Right*—In the cradle of Christian civilization 864 feet below sea level.

Lincoln Welder, gasoline engine driven type, used on the majority of arc-welded pipe line jobs.

"Take a look, Lad, at some snapshots one of my friends sent me from the 1180-mile Iraq pipe line job.

"He writes that in spite of the handicaps of strong winds, sand storms and rugged country, a gang comprised of two welders and a tacker are tying-in as high as two miles of line in an eight-hour day."

What's NEW in Welding!

PROCEDURE HAND BOOK
OF ARC WELDING
DESIGN AND PRACTICE

434 pages, $1.50—Write for description

"That's no surprise, Pop, when you consider the welding equipment they're using—namely, Lincoln welders and *'Fleetweld'* electrodes.

"That's a combination that sets records not only for speed of welding but also for quality of welds.

"Geography makes no difference to the performance guarantee on Lincoln welders and *'Fleetweld'* electrodes, which reads:

1. More weld metal deposit per K.W. H.
2. Faster welding per K.W.H.
3. Lower cost per unit of welding—the unit being per lineal foot of weld, or per pound of weld metal, or per hour of welding.

"If you want a permanently tight line at low cost it will pay you to check first with

LINCOLN

THE LINCOLN ELECTRIC COMPANY, CLEVELAND, OHIO

Largest Manufacturers of Arc Welding Equipment in the World

W-55

PROFIT FOR YOU *because...*

IT FITS MORE JOBS

Profit margins today leave little allowance for time lost by misfit, obsolete or impractical equipment. A Buckeye Model 160 Ditcher will fit 75% of all types of ditching jobs and make you a profit on every one. Get the facts.

THE BUCKEYE Traction Ditcher CO.
FINDLAY, OHIO, U. S. A.

DIGS 16" to 42" WIDE
DITCH up to 12'-6" DEEP

SHIFTABLE BOOM — DIGS ANYWHERE

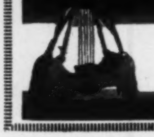
Buckeye✓

LIMA

SHOVELS-CRANES-CLAMSHELLS-DRAGLINES
3-4 yd., 1 yd., 1 1-4 yd. and 1 1-2 yd.
(A TYPE AND SIZE FOR EVERY JOB)
The Ohio Power Shovel Company
Division Lima Locomotive Works, Incorporated
Lima, Ohio, U. S. A.
LIMA

"HERCULES" RED-STRAND
REG. U.S. PAT. OFF.
WIRE ROPE
Made Only by A. LESCHEN & SONS ROPE CO. Est. 1857
New York Chicago ST. LOUIS Denver San Francisco

Hayward Buckets



Use this Class "K" Clam Shell for excavating and hard digging.
THE HAYWARD CO., 48-50 Church St., N.Y.

BALL BEARING
BUCKETS
FOR HARD DIGGING, FAST REHANDLING AND EXTREMELY LOW MAINTENANCE
FARMER'S BANK BLDG. PITTSBURGH, PA.
BLAW-KNOX

CRESCENT SCRAPER —
The world's premier bottomless drag bucket. Great digging power and structural strength combined with light weight and ease of handling.
Write for Catalog 16.
SAUERMAN BROS., INC.
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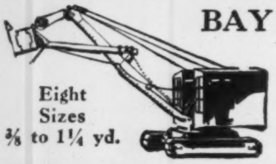

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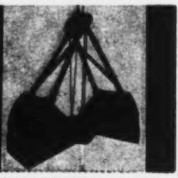

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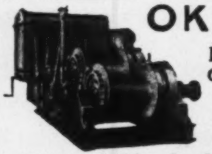

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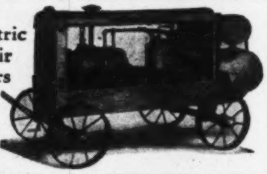

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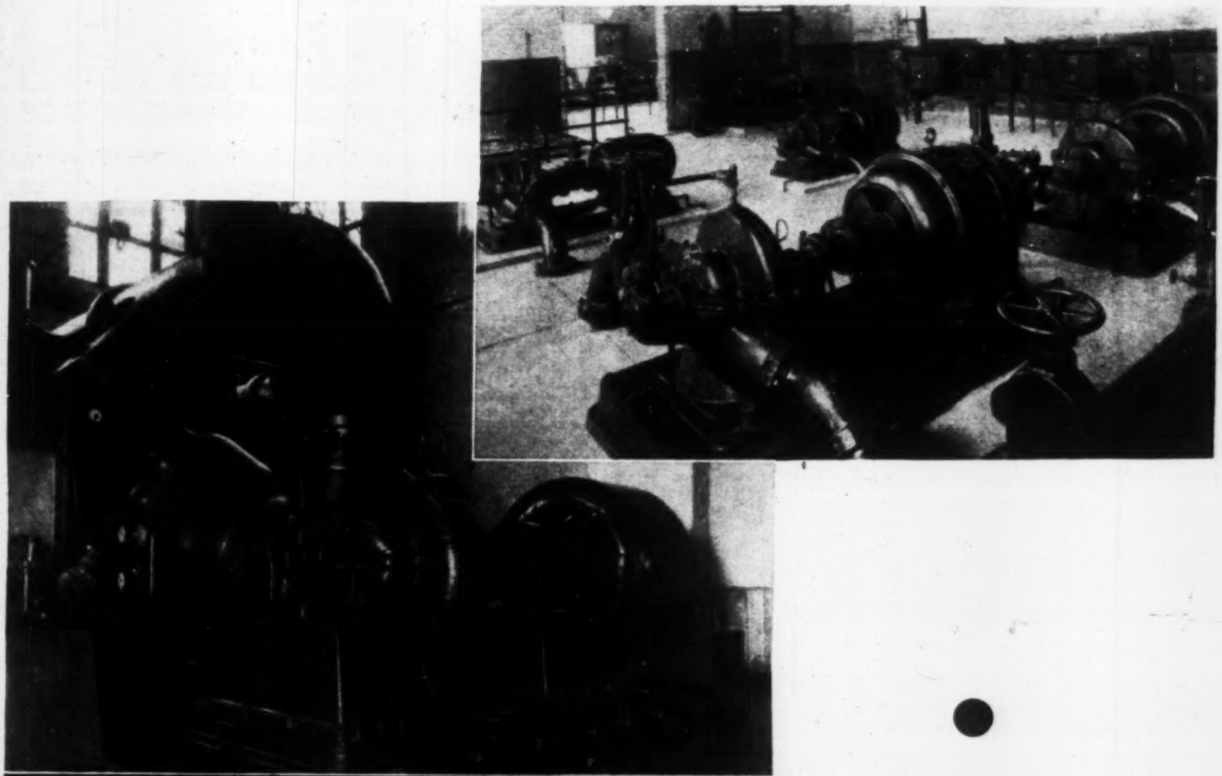

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The Model 30 for
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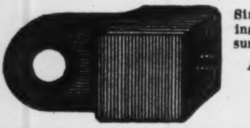

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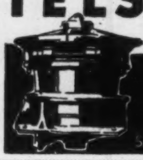

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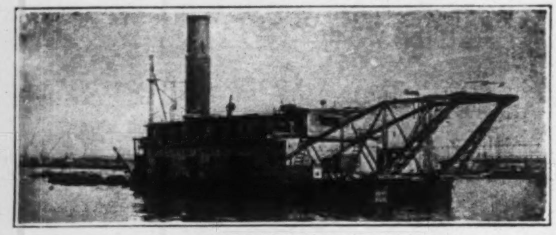

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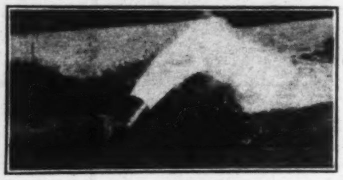

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OFFICIAL PROPOSALS

U. S. Government

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation (Federal Emergency Administration of Public Works Project), Washington, D. C., December 19, 1933. Sealed bids (Specifications No. 559) will be received at the office of the Bureau of Reclamation, Ontario, Oregon, until 10 o'clock a.m., January 18, 1934, and will at that hour be opened for furnishing labor and materials and performing all work for the *construction of the Owyhee River and Snivley siphons and concrete bench flume,* North Canal, Mitchell Butte division, Owyhee project, Oregon-Idaho. The work is located near Nysaa and Ontario, Oregon, on the Oregon Short Line Railroad. The principal items and the estimated quantities involved are as follows: 15,000 cubic yards of all classes of open-cut excavation; 2,400 cubic yards of backfill; 3,700 cubic yards of concrete in structures; 800 cubic yards of riprap; 400 square yards of dry-rock paving; placing 412,000 pounds of reinforcement bars; erecting 1,800,000 pounds of welded plate-steel siphon pipe; erecting 864,000 pounds of structural steel in bridge and approaches; erecting 90,000 feet b.m. of timber in bridge and approaches; and installing 13,000 pounds of miscellaneous metal work. This invitation for bids does not cover the purchase of materials which are to be furnished by the Government. Materials to be furnished by the contractor and those furnished by the Government are described in the specifications which will be a part of the contract. No charge for specifications and plans to prospective bona fide bidders; to others, $2.50, not returnable. For particulars, address the Bureau of Reclamation, Ontario, Oregon; Denver, Colorado; or Washington, D. C.—ELWOOD MEAD, COMMISSIONER. (266)

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation, (Federal Emergency Administration of Public Works Project), Washington, D. C., December 18, 1933. Sealed bids (Specifications No. 558) will be received at the office of the Bureau of Reclamation, Denver, Colorado, until 2 o'clock, p.m., January 15, 1934, and will at that hour be opened, for furnishing and delivering f.o.b. cars at the factory shipping point or at Dunaway, Oregon, *welded plate-steel pipe* 10-feet 6-inches and 9-feet in diameter for the Snivley and Owyhee River siphons, respectively, together with supporting brackets, roller assemblies, expansion joints, manholes, drain connections and other appurtenant parts; and a *three-span through-truss bridge,* about 515 feet in length, to carry the plate-steel pipe and a road for the Owyhee River siphon over the river; all for the North Canal, Mitchell Butte division, Owyhee project, Oregon-Idaho. The pipe and bridge will be installed by the Government. No charge for specifications and drawings to prospective bona fide bidders; to others, $2.00, not returnable. For particulars, address the Bureau of Reclamation, Denver, Colorado; or Washington, D. C. ELWOOD MEAD, Commissioner. (265)

UNITED STATES DEPARTMENT OF THE INTERIOR, Bureau of Reclamation (Federal Emergency Administration of Public Works Project), Washington, D. C., December 18, 1933. Sealed bids (Specifications No. 560) will be received at the office of the Bureau of Reclamation, Vale, Oregon, until 10 o'clock a.m., January 16, 1934, and will at that hour be opened for furnishing labor and materials and performing all work for the *construction of the Agency Valley Dam,* Vale project, Oregon. The work is located near Vale, Oregon, on the Oregon Short Line Railroad. The principal items and the estimated quantities involved are as follows: 35,000 cubic yards of stripping for embankments; 2,800 cubic yards of tunnel and shaft excavation; 626,900 cubic yards of excavation in open cut; 2,500 cubic yards of backfill about structures; 480,000 cubic yards of earth fill embankment; 105,500 cubic yards of riprap and rock fill; 1,020 cubic yards of concrete in tunnels and shaft; 5,000 cubic yards of concrete in

U. S. Government

other structures; 5,000 cubic feet of pressure grouting; placing 385,000 pounds of reinforcement bars; placing 2,750 linear feet of drain piping; and installing 302,370 pounds of metal work. This invitation for bids does not cover the purchase of materials which are to be furnished by the Government. Materials to be furnished by the contractor and those furnished by the Government are described in the specifications which will be a part of the contract. No charge for specifications and plans to prospective bona fide bidders; to others, $2.00, not returnable. For particulars, address the Bureau of Reclamation, Vale, Oregon; Denver, Colorado; or Washington, D. C.—ELWOOD MEAD, COMMISSIONER. (267)

OFFICIAL PROPOSALS

Bids: February 6.

Shield Driven Tunnel and Shafts

Sealed Proposals for Shield Driven Tunnel and Shafts of the Midtown Hudson Tunnel between Weehawken, New Jersey, and Manhattan, New York, will be received at the office of the General Manager of the Port Authority until 11 o'clock, Eastern Standard Time, on the morning of Tuesday, February 6, 1934.

A more complete description of the work and full information for bidders is given on the drawings and in other contract papers, which will be ready on Tuesday, January 2, 1934, and may be seen at the office of the

CHIEF ENGINEER
THE PORT OF NEW YORK AUTHORITY
111 EIGHTH AVENUE, NEW YORK CITY

The work called for by the proposal is to be performed in conformity with the Rules, prescribed by the President, and the policies, adopted by the Government, to carry out the purposes, and which control the administration of the National Industrial Recovery Act.

Complete copies of the foregoing papers will be furnished upon deposit of $25.00 per set. The deposit will be remitted if the papers are returned in good condition, not later than thirty days after the opening of bids.

THE PORT OF NEW YORK AUTHORITY
GEORGE R. DYER,
Chairman.

Bids: January 30.

Pipes, Hydrants and Valves

CAPITAL OF PUERTO RICO
OFFICE OF THE CITY MANAGER
San Juan, Puerto Rico,
December 19, 1933.

Sealed proposals will be received by the Administrative Board of the Capital, at the Office of the City Manager, City Hall, San Juan, Puerto Rico, until 2 o'clock P.M. on January 30, 1934, and then publicly opened, for:

THE FURNISHING AND DELIVERY OF PIPES, HYDRANTS AND VALVES, consisting of seven separate contracts: CONTRACTS Nos. 13-A; 13-B; 13-C; 13-D; 13-E; 14-A and 14-B.

Instructions to Bidders, General and Special conditions, Proposal Form, Specifications and Plans, and all other information pertaining to the proposed work may be obtained at the Office of the Director of Public Works, upon payment at the Office of the Treasurer of the Capital, of $20.00 which amount will be refunded upon the return of the plans and specifications in good condition within a period of twenty (20) days after the date of the bidding.

Specifications and all other documents may be also obtained at the Office of the Bureau of Insular Affairs, Washington, D. C., upon depositing a certified check for the above mentioned sum, payable to the Capital of Puerto Rico.

The Administrative Board of the Capital reserves the right to reject any or all bids and to award the contract upon other considerations than that of price alone.

J. BENITEZ CASTANO,
City Manager.

OFFICIAL PROPOSALS

Bids: January 30.

Addition to Guaynabo Filter Plant

CAPITAL OF PUERTO RICO
OFFICE OF THE CITY MANAGER
San Juan, Puerto Rico,
December 19, 1933.

Sealed proposals will be received by the Administrative Board of the Capital, at the Office of the City Manager, City Hall, San Juan, Puerto Rico, until 10 o'clock A. M. on January 30, 1934, and then publicly opened, for THE ADDITION TO THE GUAYNABO FILTER PLANT, consisting of two separate contracts:

CONSTRUCTION WORK (CONTRACT NO. 6)

MECHANICAL EQUIPMENT (CONTRACT NO. 7)

Instructions to Bidders, General and Special Conditions, Proposal Form, Specifications, and all other information pertaining to the proposed work may be obtained at the Office of the Director of Public Works, upon payment at the Office of the Treasurer of the Capital, of $50.00 which amount will be refunded upon the return of the specifications in good condition within a period of twenty (20) days after the date of the bidding.

Specifications and all other documents may be also obtained at the Office of the Bureau of Insular Affairs, Washington, D. C., upon depositing a certified check for the above mentioned sum, payable to the Capital of Puerto Rico.

The Administrative Board of the Capital reserves the right to reject any or all bids and to award the contract upon other considerations than that of price alone.

NOTE: Besides the above mentioned deposit of $50.00 a charge of $5.50 will be made for each set of plans.

J. BENITEZ CASTANO
City Manager.

Bids: January 16.

Heating Work

KNIT SHOP & SERVICE CONN.
SING SING PRISON
OSSINING, N. Y.
Spec. No. 6856

Sealed proposals covering Heating Work, Knit Shop and Service Connections, Sing Sing Prison, Ossining, N. Y., in accordance with Specification No. 6856 and accompanying drawings, will be received by The Commissioner, Department of Correction, 17th Floor, State Office Building, Albany, N. Y., until 2 o'clock P.M. (Eastern Standard Time) on Tuesday, January 16, 1934.

Proposals shall be accompanied by a certified check or money deposit of 5% of the amount of the bid. Successful bidder will be required to give a bond in the sum of 50% of the amount of the contract. Corporations submitting proposals shall be authorized to do business in the State of New York.' Drawings and specifications may be examined free of charge at the following offices:

Commissioner of Architecture, State Office Building, New York City.
Commissioner of Architecture, State Office Building, Albany, N. Y.
District Engineer, 109 N. Genesee St., Utica, N. Y.
District Engineer, Weighlock Building, Syracuse, N. Y.
District Engineer, Barge Canal Terminal, Rochester, N. Y.
District Engineer, 65 Court St., Buffalo, N. Y.
District Engineer, 71 Frederick St., Binghamton, N. Y.
Sing Sing Prison, Ossining, N. Y.

Drawings and specifications may be obtained from the Commissioner of Architecture, State Office Building, Albany, N. Y., upon payment of $5.00 for each set of drawings and specifications. Proposal blanks and envelopes will be furnished without charge.

Half of this payment will be returned if the drawings and specifications are returned in good condition to the Commissioner of Architecture, State Office Building, Albany, N. Y., within two weeks after date of opening bids.

DATED: December 8, 1933.

OFFICIAL PROPOSALS

Bids: January 6.

Pier Foundations, Etc.

TRIBOROUGH BRIDGE AUTHORITY

Sealed bids will be received by the Triborough Bridge Authority, at its office, 4th floor, 141 Broadway, New York, N. Y., until 11:00 a.m. on Saturday, January 6th, 1934, for the construction of the Pier Foundations, etc., Randall's Island and Little Hell Gate, of the Triborough Bridge connecting the Boroughs of Manhattan, the Bronx and Queens.

The work must be commenced within five days after notification by the Triborough Bridge Authority to begin work and be completed within two hundred and ten (210) consecutive calendar days.

The amount of security to guarantee the faithful performance of the work shall be at least equal to the total amount of the contract price.

Each bid must be accompanied by a deposit in cash or certified check payable to the order of Triborough Bridge Authority in accordance with the Notice to Contractors, for an amount not less than five per cent of the total amount of the bid.

Such checks or money must not be enclosed in the envelope containing the bid, but must be handed in a separate sealed envelope to the official of the Authority receiving the bids. Immediately after the time for the receipt of bids shall have been declared closed, the Authority will proceed with the examination of the checks. If any check shall fail to meet the requirements set forth in the Notice to Contractors, the accompanying bid shall not be received but shall be returned to the bidder unopened.

The Authority reserves the unqualified right, in its sole and absolute discretion, to reject any or all bids or proposals.

Blank forms for bids, notice to contractors, contract form and specifications may be obtained at the office of the Triborough Bridge Authority. Arrangements will be made whereby persons desiring sets of prints of plans for their own use may secure same, the cost thereof to be paid by applicant. All the provisions contained in the notice to contractors and in bid sheet must be followed by bidders in submitting bids.

Dated December 22, 1933.

NATHAN BURKAN,
Chairman,
Triborough Bridge Authority.

Bids: January 15.

Subway

Philadelphia, Pa.

Sealed bids for the construction of a subway from Eighth and Race Streets to the Delaware River Bridge and an underpass in Fifth Street from Cherry to Callowhill Streets, Philadelphia, Pennsylvania, identified as "Contract No. 1, Delaware River Joint Commission High-Speed Rail Transit Line" will be received at the office of the Secretary of the Joint Commission, Administration Building, Bridge Plaza, Camden, New Jersey, until 1:30 p.m. (Eastern Standard Time), Monday, January 15, 1934, and there and then will be publicly opened and read.

The work is to be paid for out of funds furnished by the United States Government and must be performed in conformity with the rules prescribed by the President and the policies adopted by the Government to carry out the purposes and which control the Administration of the National Industrial Recovery Act. Every bidder must submit a signed statement of compliance on United States Government Form No. P.W. A-61 with his bid.

Plans and specifications may be obtained upon deposit of $25.00, which will be remitted if the papers are returned within one month after opening of bids. The right is reserved to reject any or all bids.

GIFFORD PINCHOT, Chairman.
JOSEPH K. COSTELLO, Secretary.
Administration Building,
Bridge Plaza,
Camden, New Jersey.
December 15, 1933.

U. S. Government

U. S. ENGINEER OFFICE, 13th Floor, Customhouse, Boston, Mass.—Sealed bids will be received here until 12 M., January 3, 1934, and then opened, for *constructing superstructures of two highway bridges across Cape Cod Canal, Mass.* Further information on application. (255)

U. S. Government

WAR DEPARTMENT—Office of the Constructing Quartermaster, Aberdeen Proving Ground, Maryland—Sealed proposals for the *construction of Twelve (12) Type C Field Officers' Quarters and Ten (10) Type C Company Officers' Quarters at Aberdeen Proving Ground, Maryland,* will be received and publicly opened in this office at 10:00 a.m. (E.S.T.), Saturday, January 6, 1934. Plans and specifications can be obtained from this office on a deposit of $45.00. (2613)

WAR DEPARTMENT—Office of Constructing Quartermaster, Maxwell Field, Alabama. Sealed proposals will be received at this office until 10:00 a.m. (C.S.T.), January 5, 1934, and then publicly opened for *construction of Addition to Fire Station at Maxwell Field, Alabama.* Prospective Bidders may obtain plans and specifications upon deposit of certified check in amount of $15.00, made payable to the Treasurer of the United States. (268)

U. S. ENGINEER OFFICE, Norfolk, Va. —Sealed bids will be received here until 3 p.m., Jan. 3, 1934, and then publicly opened, for *constructing concrete sea wall, bulkhead, and fills, at Fort Monroe, Va.* The work is to be performed in accordance with requirements of National Industrial Recovery Act of 1933. Plans and specifications may be obtained upon deposit of certified check for $5.00. Further information on application. (2412)

U. S. ENGINEER OFFICE, Buffalo, N. Y. —Sealed bids will be received here until 2:00 P.M. Eastern Standard Time, January 3, 1934, and then publicly opened, for furnishing all plant, labor and materials and performing all work required for *constructing a lakeward extension to the west breakwater, approximately 500 feet long; and constructing a light foundation at the outer end of the proposed west breakwater extension at Fairport Harbor, Ohio.* Further information on application. (253)

WAR DEPARTMENT, Office of Constructing Quartermaster, Fort George G. Meade, Maryland.—Sealed proposals will be received at this office until 11:00 A.M., E.S.T., January 2, 1934, and then publicly opened for the *construction and completion of Stables at Fort George G. Meade, Maryland.* Plans and specifications will be furnished upon deposit of Certified Check in amount of $10.00 made payable to the Treasurer of the United States. Information at the above address. (2511)

WAR DEPARTMENT, Office of Constructing Quartermaster, Fort George G. Meade, Maryland.—Sealed proposals will be received at this office until 11:00 A.M., E.S.T., January 3, 1934, and then publicly opened for the *construction of Fire Station and Guard House at Fort George G. Meade, Maryland.* Plans and specifications will be furnished upon deposit of Certified Check in amount of $20.00 made payable to the Treasurer of the United States. Information at the above address. (2510)

SEALED PROPOSALS will be opened by the Supt. of Lighthouses, Key West, Fla., 2 p.m., January 11, 1934, for furnishing and delivering f.o.b., Miami, Fla., *metal work for nine iron structures for Miami Harbor, Fla.* Information upon application. (249)

U. S. ENGINEER OFFICE, Rock Island, Illinois.—Sealed bids, in duplicate, will be received at this office until 2:00 p.m., January 3, 1934, and then publicly opened, for furnishing all plant, labor and materials, and performing all work required for the *construction of Lock No. 18, Mississippi River, approximately 7 miles upstream from Burlington, Iowa,* along the Illinois shore. Further information on application. (243)

U. S. ENGINEER OFFICE, Rock Island, Illinois.—Sealed bids, in duplicate will be received at this office until 2:00 p.m., January 11, 1934, and then publicly opened, for *furnishing all plant, labor and materials and performing all work required for the construction of Lock No. 11, Mississippi River, vicinity of Dubuque, Iowa.* Further information on application. (256)

WAR DEPARTMENT: Office of the Constructing Quartermaster, Fort Benning, Georgia. Sealed proposals will be received at this office until 10:00 A.M., C.S.T., January 5, 1934, and then publicly opened for *construction of One (1) Fire Station, at Fort Benning.* Plans and Specifications will be furnished upon deposit of certified check in amount $10.00 made payable to the Treasurer of the U. S. Information at the above address. (2622)

U. S. Government

UNITED STATES ENGINEER OFFICE, NORFOLK, VA.—Sealed bids will be received here until 3 p.m., January 12, 1934, and then publicly opened, for furnishing materials and *constructing Shed for Mobile Searchlights at Fort Monroe, Va.* The work will be performed in accordance with requirements of National Industrial Recovery Act of 1933. Further information on application. (2610)

NIRA—WAR DEPARTMENT—U. S. Engineer Office, 332 Post Office Building, Baltimore, Md.—Sealed bids will be received here until 10:00 A.M., Eastern Standard Time, January 3, 1934, and then publicly opened for *building approximately 458 Linear Feet Steel Sheet Pile bulkhead at Ocean City, Md.* Bidders must sign and comply in advance with the appropriate N.I.R.A. codes. (252)

WAR DEPARTMENT—Office of the Constructing Quartermaster, Aberdeen Proving Ground, Maryland—Sealed proposals for the construction of *eighteen sets of noncommissioned quarters at Aberdeen Proving Ground, Maryland,* will be received and publicly opened at 10:00 a.m. (E.S.T.), Friday, Jan. 5, 1934. Plans and specifications can be obtained from this office on a deposit of $15.00. (2614)

WAR DEPARTMENT—United States Engineer Office, 39 Whitehall Street, New York, N.Y.—Sealed bids, in duplicate, will be received until 11 a.m. (E.S.T.), January 9, 1934, and then publicly opened, for furnishing all labor and materials and performing all work for *dredging approximately* 1,700 *cubic yards of soft material and broken rock and boulders from New York and New Jersey Channels at Carteret, N. J.* (2615)

U. S. ENGINEER OFFICE, P. O. Box 667, Vicksburg, Mississippi—Sealed bids will be received at this office until 11 o'clock a.m., January 23, 1934, and then opened, for *constructing and delivering afloat at Vicksburg, Mississippi, one self-propelled Channel and Snag Boat complete.* (261)

WAR DEPARTMENT, Office of the Constructing Quartermaster, Fort Knox, Kentucky. Sealed proposals will be received at this office until 11:00 A.M., C.S.T., January 9, 1934, and then publicly opened for *construction of Radio Building at Fort Knox, Kentucky.* Plans and specifications will be furnished upon deposit of certified check in amount of $5.00 made payable to the Treasurer of the U. S. Information at the above address. (2619)

UNITED STATES ENGINEER OFFICE, Detroit, Mich—Sealed bids, in duplicate, will be received until 11:00 o'clock a.m. (E.S.T.), January 9, 1934, for *dredging approximately* 210,600 *cubic yards of material from Marine City Shoal, St. Clair River, Mich.* Further information on application. (2618)

COMMISSIONERS, D. C., Washington, December 26, 1933. Sealed proposals will be received at Room 509 District Building until 2:00 o'clock p.m. January 23, 1934, and then publicly opened, for *removing existing bridge and constructing a sone-faced, reinforced concrete arch and stone-faced reinforced concrete abutment bridge in line of Calvert Street, across Rock Creek Park, in the District of Columbia.* Liquidated damages, $300 a day for delay. All prospective bidders are hereby notified that any bid submitted in response to this advertisement must be accompanied by a statement of the facts in detail of the business and technical organization of the bidder available for the contemplated work, including his financial resources. The Commissioners expressly reserve the right to reject any bid in which the facts as to the business and technical organization, financial resources or experience compared with the project bid upon and based upon past known performance of the bidder justify such rejection. Proposals, specifications and drawings, not exceeding three sets, may be obtained by general contractors at the office of the Chief Clerk, Engineer Department, Room 427 District Building, upon deposit of certified check for $25 payable to the Collector of Taxes, D. C., for each set, to guarantee prompt return in good condition. Cash deposits will not be accepted. (2620)

WAR DEPARTMENT: Office of The Constructing Quartermaster, Fort Benning, Georgia. Sealed proposals will be received at this office until 10:00 A.M., C.S.T., January, 3, 1934, and then publicly opened for *construction of One (1) Ordnance Shop at this station.* Plans and Specifications will be furnished upon deposit of certified check in amount $5.00 made payable to the Treasurer of the U. S. Information at the above address. (2621)

U. S. Government

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C., December 20, 1933. Sealed bids, in duplicate subject to the conditions contained herein, will be publicly opened in this office at 3 p.m., January 18, 1934, for furnishing all labor and materials and performing all work for the *construction of attendants' quarters, doctors' apartments, junior officers' quarters "A" and "B" and residence for medical officer in charge at the U. S. Marine Hospital, Baltimore, Md.* Attention is directed to the Act of March 3, 1931 (Public No. 798) relative to rates of wages; the Act of March 3, 1933 (Public No. 428) relative to domestic materials, and the special conditions of bidding set forth in the specification. Drawings and specifications, not exceeding five sets, may be obtained at this office in the discretion of the supervising architect by any general contractor, and provided a deposit of $25.00 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any sub-contractor or material firm interested, and to quantity surveyors, provided a deposit of $25.00 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the United States. Cash deposits will not be accepted. JAS. A. WETMORE, Acting Supervising Architect. (2611)

WAR DEPARTMENT, Office of the Constructing Quartermaster, Middletown Air Depot, Middletown, Pa. Sealed proposals will be received at this office until 11:00 A.M., January 4, 1934, and then publicly opened for *construction of Administration and Dispensary Building at this Post.* Plans and Specifications will be furnished upon deposit of certified check in the amount of $25.00 made payable to The Treasurer of the U. S. Information at the above address. (2514)

WAR DEPARTMENT—Office of Constructing Quartermaster, Maxwell Field, Alabama—Sealed proposals will be received at this office until 10:00 a.m. (C.S.T.), January 4, 1934, and then publicly opened, for *construction of Twenty-five* (25) *Officers' Quarters at Maxwell Field, Alabama.* Prospective bidders may obtain plans and specifications upon deposit of certified check in amount of $45.00, made payable to the Treasurer of the United States. (2617)

WAR DEPARTMENT, Office of the Constructing Quartermaster, Fort Knox, Kentucky. Sealed proposals will be received at this office until 11:00 A.M., C. S. T., January 4, 1934, and then publicly opened for *construction of Mechanized Cavalry Park at Fort Knox, Kentucky.* Plans and specifications will be furnished upon deposit of certified check in amount of $20.00 made payable to the Treasurer of the U. S. Information at the above address. (264)

WAR DEPARTMENT—Office of Constructing Quartermaster, Fort George G. Meade, Maryland—Sealed proposals will be received at this office until 11:00 a.m. (E.S.T.), January 8, 1934, and then publicly opened for the *construction of Headquarters and Administration Building at Fort George G. Meade, Maryland.* Plans and specifications will be furnished upon deposit of certified check in amount of $30.00, made payable to the Treasurer of the United States. Information at the above address. (2612)

U. S. ENGINEER OFFICE, 428 Customhouse, St. Louis, Mo. Sealed bids, in duplicate, will be received until 11:00 A.M., January 5, 1934, and then opened, for furnishing all labor and materials and performing all work for placing about 630,000 cu.yds. of *earthwork in rebuilding and enlarging a portion of the back levee of the Clear Creek Drainage & Levee District, Union & Alexander Counties, Ill., on the Mississippi River.* Further information on application. (263)

WAR DEPARTMENT, Office Constructing Quartermaster, Fort Bragg, N. C. Sealed proposals in triplicate will be received until 10:00 A.M., E. S. T., January 10, 1934, and then publicly opened for the *construction and completion of One (1) Quartermaster Maintenance Building, including the utilities thereto, at Fort Bragg, N. C.* Plans and specifications will be furnished upon deposit of certified check in the amount of $20.00 made payable to Treasurer of the U. S. Information at the above address. (262)

U. S. Government

SEALED BIDS, indorsed "Bids for quarters, Specification No. 7526," will be received at the Bureau of Yards and Docks, Navy Department, Washington, D. C., until 11 o'clock a.m., Feb. 8, 1934, and then and there publicly opened, *for quarters at the Naval Submarine Base, Pearl Harbor, T.H.* The work includes *concrete piles and frame work; ;glazed vitrified tile; steel windows; hollow metal and metal covered work; built-up roofing and sheet metal work; marble, tile and terrazzo work; lathing and plastering; wood doors, framing and finish; and plumbing, refrigerating and electrical systems.* Hourly wage rates for work at site of construction project shall be not less than $1.00 for skilled labor and $0.45 for unskilled labor. The Government reserves the right to require, prior to the award of the contract, a statement of facts in detail of the business and technical organization and plant of the bidder available for the contemplated work, including financial resources for such part of the work as is not provided for by the stipulation in Article 16 of the Contract to be used, and experience of organization in construction of comparable work. The Government reserves the right to reject any bid respecting which the facts as to business and technical organization, financial resources, plant, or experience, compared with the project bid upon, justify such rejection. Specification No. 7526 and accompanying drawings may be obtained on application to the Bureau or to the Commandant, Fourteenth Naval District, Navy Yard, Pearl Harbor, T. H., or to the Commandant, Twelfth Naval District, 100 Harrison St., San Francisco, Calif. Deposit of a check or postal money order for $50, payable to the Chief of the Bureau of Yards and Docks, is required as security for the safe return of the drawings and specification. G. A. McKAY, Acting Chief of Bureau. (257)

TREASURY DEPARTMENT, Procurement Division, Public Works Branch, Washington, D. C., December 12, 1933.—Sealed bids, in duplicate subject to the conditions contained herein, will be publicly opened in this office at 3 p.m., January 2, 1934, for furnishing all labor and materials and performing all work for the *construction of the foundations of the U. S. parcel post building at Boston, Mass.* Attention is directed to the special conditions of bidding set forth in the specification and bulletin No. 51 of the federal emergency administration of public works attached thereto. Drawings and specifications, not exceeding three (3) sets, may be obtained at this office in the discretion of the supervising architect by any general contractor, and provided a deposit of $25.00 is made for each set to assure its prompt return. One set will be furnished builders' exchanges, chambers of commerce or other organizations who will guarantee to make them available for any sub-contractor or material firm interested, and to quantity surveyors, provided a deposit of $25.00 is made to assure its prompt return. Checks offered as deposits must be made payable to the order of the Treasurer of the United States. Cash deposits will not be accepted. JAS. A. WETMORE, Acting Supervising Architect. (254)

WAR DEPARTMENT—Office Constructing Quartermaster, Fort Bragg, N. C.—Sealed proposals in triplicate will be received until 10:00 a.m. (E.S.T.), January 4, 1934, and then publicly opened for the *construction and completion of one* (1) *Field Artillery Board Building, Two* (2) *Four* (4) *Car Garages, and One* (1) *Six* (6) *Car Garage, at Fort Bragg, N. C.* Plans and specifications will be furnished upon deposit of certified check in the amount of $20.00, made payable to Treasurer of the United States. Information at the above address. (2616).

WAR DEPARTMENT—Office of Constructing Quartermaster, Langley Field, Virginia. Sealed proposals will be received at this office until 1:30 p.m. (E.S.T.), January 5, 1934, and then publicly opened for *Construction of Additions to One* (1) *Type "B" Annex, Hangar "A," Building* 530, *Installing Beams, Hangars 'A" and B," Building* 530, *and Installing Precast Gypsum Ceilings in Hangar Buildings at Langley Field, Virginia.* Plans and specifications will be furnished upon deposit of certified check in amount of fifteen dollars ($15.00) made payable to The Treasurer of the United States. Information at the above address. (269)

OFFICIAL PROPOSALS

Bids: January 8.

State Highway Work

STATE OF NEW JERSEY
STATE HIGHWAY COMMISSION
TRENTON

NOTICE IS HEREBY GIVEN that sealed bids will be received by the State Highway Commission for:

ROUTE NO. 24, SECTION NO. 1

Construction of Route No. 24, Section No. 21, Approaches to D. L. & W. Railroad Bridge at Port Colden, Warren County. Length 0.338 miles.

Estimated:

8,498 sq.yds. 9" rein. conc. pavement
250 sq.yds. 18" rein. conc. bridge approach slabs
1,329 sq.yds. bituminous penetration macadam

Bids for the above will be received at the office of the State Highway Commission, State House Annex, Trenton, N. J., on Monday, January 8, 1934, at twelve o'clock, 12:00 Noon, Eastern Standard Time, and will be opened and read immediately thereafter.

The receipt and opening of bids is subject to the proper qualification of the bidder in accordance with the provisions of the prequalification law and the regulations adopted by the State Highway Commission. Bidders must submit a revised financial statement and statement of plan and equipment with their bid.

NOTE: The proposed work is a "United States Public Works Project NRH-32C" under the provisions of Title II, Section 204, of the National Industrial Recovery Act approved June 16, 1933, and is to be performed in accordance with the Special Provisions and Requirements of the United States Department of Agriculture, Bureau of Public Roads, as outlined in the Instructions to Bidders to be made a part of the specifications and contract, which provisions require the employment of labor to be obtained from lists furnished by the National Reemployment Office, Municipal Building, Washington, New Jersey, preference in employment to be given to qualified ex-service men with dependents.

The attention of bidders is directed to the Special Provisions covering subletting or assigning the contract and to the use of Domestic Materials. The minimum wage paid to all skilled labor employed on this contract shall be 65c per hour. The minimum wage paid to all unskilled labor employed on this contract shall be 40c per hour.

Drawings, specifications and form of bid, contract and bond for the proposed work are on file in the office of the State Highway Department, Trenton, N. J., and may be inspected by prospective bidders during office hours. Plans will be furnished on a deposit of Ten Dollars ($10.00) for each set of plans upon application to the State Highway Department, Room 102, State House Annex, Trenton, N. J. Bids must be made on the standard proposal forms in the manner designated in the 1933 standard State Highway specifications and must be enclosed in sealed special addressed envelopes bearing the name and address of the bidder and work bid upon on the outside, and must be accompanied by a certified check drawn to the order of the Treasurer of the State of New Jersey for not less than ten per cent (10%) of the amount of the bid, provided that the said certified check shall not be less than $500.00 nor more than $20,000.00 and must be delivered at the above place on or before the hour named. **Copies of the standard proposal** form and special addressed envelopes will be furnished on application. Bids not enclosed in special addressed envelopes will be considered informal and will not be opened. The right is reserved to reject any or all bids.

By order of the State Highway Commission.

A. LEE GROVER,
Chief Clerk.

Bids: January 5.

Pennsylvania Department of Highways, Harrisburg, Pennsylvania—Bids will be re-received January 5, 1934, for the construction of three road projects, totaling approximately 3 miles; construction to be reinforced concrete and bituminous E; also for the construction of one through truss bridge. Projects situated in the following counties:

Erie
Lawrence (bridge)
Lebanon
Washington

All are National Recovery projects. Full particulars upon application to S. S. Lewis, Secretary of Highways, Harrisburg, Pennsylvania.

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CIVIL ENGINEER, 25 years' experience (as engineer and as construction superintendent with American companies at home and foreign countries) on waterworks, sewers, river training works, canal, dam, dock, tunnel, highways, bridges, housing, topographic surveys, desires work anywhere in world. G. Y., P. O. Box 16, Hohenwald, Tenn.

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MUNICIPAL engineer, 17 years in city construction work, desires a connection as a sales engineer. Best references. PW-549, Engineering News-Record, 330 West 42d St., New York City.

Superintendents

SUPERINTENDENT, 25 years' practical experience harbor work, bridges, dams, reservoirs, sewerage disposal plants, pipe lines, and all heavy construction. PW-546, Engineering News-Record, 330 West 42d St., New York City.

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WANTED immediately high grade salesman—graduate engineer preferred—capable of selling heavy fabricated steel plate and structural work, including hydraulic and floating equipment for well established and modernly equipped plant. Splendid opportunity. Give full particulars. SW-544, Engineering News-Record, 330 West 42d St., New York City.

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100—50-ton Steel Hopper Coal Cars.

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- 1—P&H Model 600, with 50-ft. boom, 1-yd. dragline or clam; serial No. 2550.
- 1—Northwest Model 105; 45-ft. boom; 1-yd. dragline or clamshell bucket; Ser. No. 2335.
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Blaw-Knox Co.

Road Machinery
Adams Co., J. D.
Allis-Chalmers Mfg. Co.
Austin-Western Rd. Mchry. Co.

Road Oils & Preservatives
Barrett Co., The

Road Rollers
Austin-Western Rd. Mchry. Co.
Good Roads Mchry. Corp.

Roofing
Barrett Co., The

Rope, Wire
American Steel & Wire Co.
Hazard Wire Rope Co.
Leschen & Sons Rope Co.

Scrapers, Dragline
Harnischfeger Corp.
McKiernan-Terry Corp.
Sauerman Bros., Inc.

Scrapers, Scarifiers, Plows
Adams Co., J. D.
Austin-Western Rd. Mchry Co.
Western Wheeled Scraper Co.

Screens, Sand, Gravel and Coal
Smith Engineering Works Iron Co

Second-Hand Equipment
(See Searchlight Section)

Sheets, Iron and Steel
Inland Steel Co.

Sheets, Roofing & Siding
Inland Steel Co.

Shovels, Power
Austin-Western Rd. Mchry. Co.
Bay City Shovels, Inc.
Buckeye Tr. Ditcher Co.
Bucyrus-Erie Co.
Harnischfeger Corp.
Industrial Brownhoist Corp.
Marion Steam Shovel Co.
Northwest Engineering Co.
Ohio Power Shovel Co.

Slag
Carnegie Steel Co.

Snow Plows
Adams Co., J. D.
Good Roads Mchry. Corp.

Snow Plows and Loaders
Austin-Western Rd. Mchry. Co.

Spreaders, Ballast
Bucyrus-Erie Co.
Western Wheeled Scraper Co.

Spreaders, Sand, Gravel and Chip
Universal Rd. Mchry. Co.

Standpipes
Chicago Bridge & Iron Works
Pittsburgh-Des Moines Steel Co.

Steel, Copper Bearing
Inland Steel Co.

Steel Forms
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Steel Plate Construction
Chicago Bridge & Iron Wks
Cole Mfg. Co., R. D.

Steel, Sheet
Inland Steel Co.

Steel, Structural
Belmont Iron Works
Carnegie Steel Co.
Inland Steel Co.
Jones & Laughlin Steel Corp.
Mount Vernon Bridge Co
Phoenix Bridge Co.
Pittsburgh-Des Moines Steel Co.
Snare Corp., Fred'k
Wellman Engineering Co.

Tanks
Chicago Bridge & Iron Wks
Cole Mfg. Co., R. D.
Pittsburgh-Des Moines Steel Co.

Tar
Barrett Co., The

Ties
Carnegie Steel Co.

Timber, Treated
Eppinger & Russell Co.

Towers, Radio and Transmission
Blaw-Knox Co.

Track, Industrial & Portable
Carnegie Steel Co.
Jones & Laughlin Steel Corp.

Tractors
Cleveland Tractor Co.
Linn Mfg. Co.

Trailers, Industrial and Portable
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Tramways
American Steel & Wire Co.
Harnischfeger Corp.
Leschen & Sons Rope Co., A.

Treads, Safety
Blaw-Knox Co.
Carnegie Steel Co.

Treads, Traffic Bridge, Steel
Carnegie Steel Co.

Trucks, Motor
Linn Mfg. Co.

Turbines
De Laval Steam Turb. Co.

Underpinning
Spencer, White & Prentis, Inc.

Unloaders, Car and Wagon
Wellman Engineering Co.

Valves
Simplex Valve & Meter Co.
Wellman Engineering Co.

Wagons and Trailers, Dump
Adams Co., J. D.
Allis-Chalmers Mfg. Co.
Austin-Western Rd. Mchry. Co.
Wellman Engineering Co.

Washers
Smith Engineering Works

Washing Units, Sand, Gravel and Stone
Universal Rd. Mchry. Co.

Waterproofing
Barrett Co., The

Welding & Cutting Apparatus
Harnischfeger Corp.
Lincoln Electric Co.

Welding Rods & Wire
American Steel & Wire Co.
Lincoln Electric Co.

Wellpoint Systems
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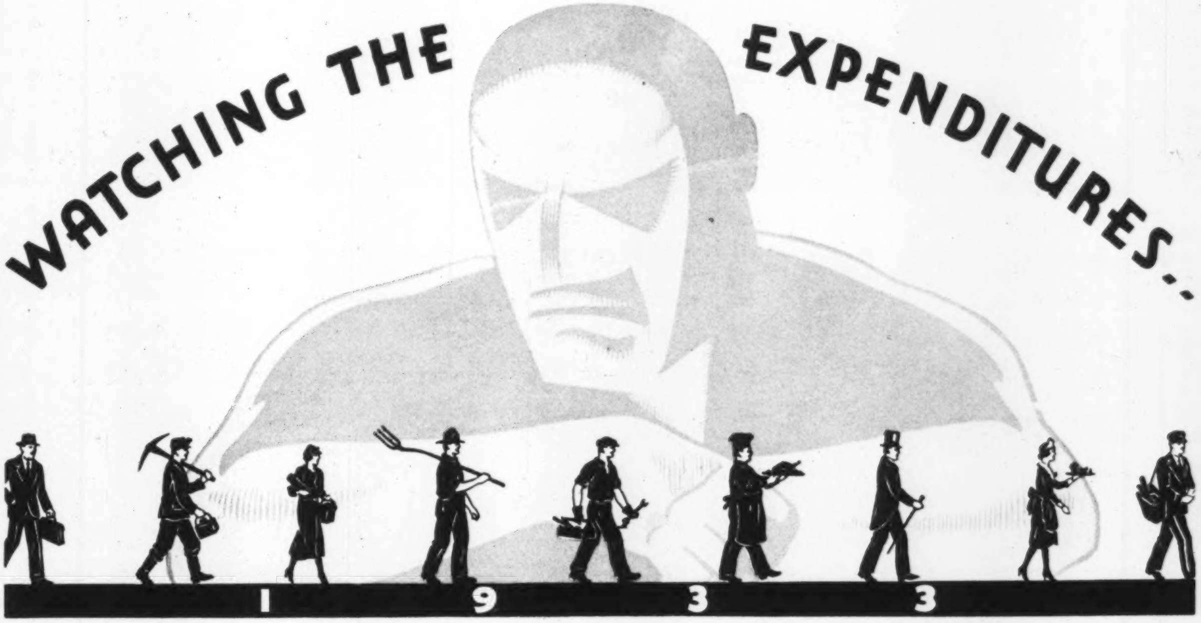

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